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SOLUBILITIES

OF

INORGANIC AND ORGANIC COMPOUNDS

A COMPILATION OF QUANTITATIVE SOLUBILITY DATA FROM THE PERIODICAL LITERATURE

BY

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SUPPLEMENT

TO THE SECOND EDITION

Containing Data Published During the Years 1917-1926 Inclusive

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PREFACE

In common with other lines of chemical research, solubility contributions have increased at a greatly accelerated rate in recent years. On account of the very large amount of this new material and the great advances in the cost of printing since the last edition of this compilation was issued, it became necessary to take into consideration the expense involved in publishing a book of the present character. The question arose as to whether a third edition should be compiled or simply a supplement containing all new data which have appeared since the second edition was completed.

There is no question but that a single book containing all quantitative solubility data arranged in alphabetical order would be more convenient to use than separate volumes containing respectively the older and the more recent results. Furthermore, the small amount of the older data shown by new experiments to be inaccurate could have been eliminated. This plan, however, would have required the republication of about 60 per cent of the total amount of the material and would have forced those who had bought the second edition and desired the new results, to repurchase the larger part of the data already in their possession. After careful consideration it was decided that the disadvantage of having to search in two volumes for a particular result was not sufficient to warrant the very considerable extra cost required for printing a completely revised third edition of the book. In order to diminish the inconvenience of having the data in a principal volume and a supplement, a subject index common to both has been provided at the end of the latter.

The collection and arrangement of the data contained in the present supplement have been made in exactly the same manner as described in the Preface and chapter on General Information of the second edition. It is suggested that those who may have need of these details refer to the descriptions there given.

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Attention is also drawn to the fact that the limitations in accuracy and completeness of the work as there described apply in equal measure to this supplementary volume. The same vigilance to avoid mistakes has been maintained but the opportunities for errors are innumerable. It cannot be affirmed that a greater accuracy has now been attained.

I am very glad to thank those who have called my attention to faults in the second edition and I will be equally grateful to those who take the trouble to notify me of mistakes they may find in this supplement.

I have been particularly fortunate in having at my disposal the excellent libraries of the Hygienic Laboratory and of the Department of Agriculture in Washington and of the Pasteur Institute of Paris. I wish to acknowledge my indebtedness to all in these institutions who have facilitated my work and I desire particularly to thank M. Roux, Director, and M. Bertrand, Chief of the Chemical Biological Division, for the hospitality extended to me at the Pasteur Institute.

A. S.

Paris, November 29, 1927.

ABBREVIATIONS.

Most of the following abbreviations will be found written both with capitals and without.

$[\alpha]_D$. — Specific Rotation.
abs. — Absolute.
abs. coef. — Absorption Coefficient.
alcohol. — Ethyl Alcohol.
amt (s). — Amount (s).
anhy. — Anhydrous.
aq. — Aqueous.
atm (s). — Atmosphere (s).
at. wt. — Atomic Weight.
av., aver. — Average.
b.-pt. — Boiling-point.
C. — Centigrade.
calc. — Calculate (ed).
cc. — Cubic Centimeter (s).
cm. — Centimeter (s).
coef. — Coefficient.
com. — Commercial.
cmpd (or compd). — Compound.
con. — Continued.
conc. — Concentration, Concentrated.
cond. — Conductivity.
const. — Constant.
cor. — Corrected.
crit. — Critical.
cryo. — Cryohydric.
cryst. — Crystalline.
d. — Dextro (in connection with the name of an optically active compound).
d. — Density (d_{18} — Specific Gravity at 18°, referred to water at 4°; $d_{\frac{20}{20}}$ at 20°, referred to water at 20°).
decomp. — Decomposition.
det. — Determined.
dif. — Different.
dil. — Dilute.
dist. coef. — Distribution Coefficient.
ed. — Edition.
elec. — Electric (al).
equil. — Equilibrium.
equiv. — Equivalent (s).
eutec. — Eutectic.
F. — Fahrenheit.
f.-pt. — Freezing-point.
g., gm., gms. — Grams (s).
gm. mol. — Gram Molecule (s).
G. M. — Gram Molecule (s).
hr (s). — Hour (s).
i. — (*d* + *l*) Inactive (in connection with the name of an optically active compound).
inorg. — Inorganic.
insol. — Insoluble.
l. — Lævo (in connection with the name of an optically active compound).
kg. kgm. — Kilogram (s).
l. — Liter (s).
mm. — Millimeter (s).
m. — Meta.
max. — Maximum.
mg., mgm. — Milligram (s).
mol (s). — Molecule (s), Molecular.
mol. wt. — Molecular Weight.
millimol. — Milligram Molecule.
m.-pt. — Melting-point.
n. — Normal (gm. equiv. per l.).
N. — Normal (used rarely).
o. — Ortho.
ord. — Ordinary.
org. — Organic.
p. — Page.
p. — Para.
pet. — Petroleum.
*p*H. — — log H-ion conc.
ppt. — Precipitate.

pt. — Point.
quad. pt. — Quadruple Point.
qual. — Qualitative.
sapon. — Saponification.
sat. — Saturated.
sol (s). — Solution (s).
sp. gr. — Specific Gravity (Density).
sq. cm. — Square Centimeter.
s. — Symmetrical.
sym. — Symmetrical.
t°. — Temperature, Centigrade Scale.
temp (s). — Temperature (s).
tr. pt. — Transition Point.
vol (s). — Volume (s).
undissoc. — Undissociated.
U. S. P. — U. S. Pharmacopœia.
wt. — Weight.
∞. — Infinity.
$^0/_0$. — Per cent.
$.10^{-2}$, $.10^{-5}$, etc., following a result means that decimal point is to be moved as many places to the left as indicated by the minus exponent.

The abbreviations of the titles of chemical journals are those used by *Chemical Abstracts*.

ACENAPHTHENE $C_{12}H_{10}$.

Solubility in Several Organic Solvents.

(Speyers — *Am. J. Sci.* [4], **14**, 294, 1902.)

Note. — It was erroneously stated in connection with the data of Speyers quoted in previous editions of this book that the original results are given in terms of gram molecules of solute per 100 gram molecules of *solvent*. This should have been gram molecules of solute per 100 gram molecules of *solution*. The errors in the calculations to the gram basis, resulting from this mistake, have now been corrected in all the tables constructed from the data of Speyers.

	In Methyl Alcohol.			In Ethyl Alcohol.			In Propyl Alcohol.		
t°.	(*a*).	(*b*).	(*c*).	(*a*).	(*b*).	(*c*).	(*a*).	(*b*).	(*c*).
0...	81.33	1.80	0.39	81.1	1.9	0.57	82.3	2.26	0.88
10...	80.40	1.70	0.38	80.3	2.8	0.84	81.8	2.40	1.00
20...	79.60	2.25	0.48	79.6	4.0	1.20	81.4	3.40	1.35
30...	79.00	3.50	0.72	79.1	5.6	1.70	80.9	4.75	1.90
40...	78.45	6.00	1.20	78.7	8.4	2.60	80.6	7.10	2.90
50...	78.15	9.00	1.77	78.8	13.2	3.90	80.7	11.10	4.40
60...	78.30	11.70	2.35	79.4	23.2	7.00	81.5	19.60	8.20
70...	78.60	14.30	2.90	80.75	40.5	12.50	83.9	37.00	16.20

	In Chloroform.			In Toluene.		
t°.	(*a*).	(*b*).	(*c*).	(*a*).	(*b*).	(*c*).
0.....	143.8	18.8	12.7	90.7	12.4	7.9
10.....	140.1	24.0	16.0	90.8	15.0	10.7
20.....	136.3	33.0	19.5	91.0	20.0	14.5
30.....	132.4	45.0	25.0	91.8	30.0	20.5
40.....	128.0	60.0	32.0	92.7	53.0	28.0
50.....	123.4	85.0	40.0	94.0	85.0	35.7
60.....	119.3	122.0	50.0	95.5	125.0	43.5
70.....	.....	.....	....	97.2	180.0	52.5

(*a*) Weight in grams of 100 cc. of sat. solution. (*b*) Grams of Acenaphthene dissolved per 100 grams solvent. (*c*) Gram molecules of Acenaphthene per 100 gram molecules of solution.

Reciprocal Solubilities, Determined by the Method of Lowering of the Freezing-point*, Are Given for Mixtures of Acenaphthene and Each of the Following Compounds:

Tetramethyldiaminodibenzylacetone (Pfeiffer, 1924.)
***o*, *m* and *p* Dinitrobenzene** (Kremann and Haas, 1919.)
1, 3, 5 Trinitrobenzene (Kremann and Strzelba, 1921.)

* *Freezing or Melting-point Curves as Solubility Data.* — When a mixture of two compounds, rendered liquid by elevation of temperature, is gradually cooled, a point will be reached at which one or the other of the constituents will separate as a solid. This point represents the solubility of the one compound in the other. The method involved, differs principally from that ordinarily employed for solubility determinations, in that the composition of the mixture remains constant while the saturation temperature is being approached, instead of the reverse procedure.

A considerable amount of data of this character is available, but, after careful consideration, it has been decided that references only will be given to it in the present volume, except in cases of mixtures of well-known compounds or of those in which water is one of the constituents.

Freezing-point lowering data (see footnote, page 1001) are also given for mixtures of Acenaphthene and each of the following compounds.

Dianisalacetone (Pfeiffer, 1924.)
Fluorenone (Pfeiffer, 1924.)
Michlers Ketone (Pfeiffer, 1924.)
o, *m* and *p* Nitrophenol (Kremann and Haas, 1919.)
1.2.4 Dinitrophenol (Kremann and Haas, 1919.)
Picramide (Efremov, 1918.)
Picric acid (Efremov, 1918.)
Picryl chloride (Efremov, 1918.)
Quinone (Kremann, Sutter, Sitte, Strzelba and Dobalzky, 1922.)
Styphnic Acid (Efremov, 1918.)
1.2.4 Dinitrotoluene (Kremann and Haas, 1919.)
1.2.6, 1.3.4, 1.3.5 Dinitrotoluene (Kremann, Königsberg and Mauermann, 1923.)
1.2.4.6 Trinitrotoluene (Kremann and Strzelba, 1921.)

Freezing-point lowering data are also given for :

Nitroacenaphthene	+	Picric acid	(Efremov, 1918.)
»	+	Styphnic acid	(Efremov, 1919 *a*.)
Acenaphthylene	+	»	(Efremov, 1918.)
»	+	Picryl chloride	(Efremov, 1918.)

ACETAMIDE $CH_3CO.NH_2$.

Solubility in Water and in Alcohol. (Speyers, 1902; see Note, page 1001.)

	In Water.			In Ethyl Alcohol.		
t°.	(*a*).	(*b*).	(*c*).	(*a*).	(*b*).	(*c*).
0.....	105.5	138.0	29.6	85.62	29.0	18.5
10.....	104.9	170.0	34.0	86.2	43.0	26.0
20.....	104.3	220.0	40.8	87.3	65.0	33.8
30.....	103.7	300.0	47.7	88.8	100.0	43.0
40.....	103.0	410.0	55.5	90,7	145.0	53.5
50.....	102.3	560.0	64.0	93.0	220.0	64.5
60.....	101.6	850.0	74.0	95.5	370.0	76.5

(*a*) Wt. of 100 cc. sat. solution in gms. (*b*) Gms. Acetamide per 100 gms. solvent. (*c*) Gm. mols. Acetamide per 100 gm. mols. solution.

100 gms. commercial absolute ethyl alcohol dissolve 31.5 gms. Acetamide at 20-25° C. (Pucher and Dehn, 1921.)

Solubility of Acetamide in Benzene by the Synthetic Method.
(Moles and Jimeno, 1913.)

	Gms. Acetamide per 100 gms.			Gms. Acetamide per 100 gms.	
t°.	Acetamide layer.	Benzene layer.	t°.	Acetamide layer.	Benzene layer.
100.....	86.0	4.0	135.....	59.0	11.5
110.....	81.0	5.0	137.5.....	55.0	14.0
120.....	74.0	6.5	140.....	50.0	19.0
125.....	70.0	7.0	142.....	39.0	24.0
130.....	65.0	8.5	142.5 crit. t..	34.0	

Solubility of Acetamide in Urethan and in *p* Toluidine.
(Mortimer, 1923.)

	In Urethan.			In *p* Toluidine.	
t°.	Gms. acetamide per 100 gms. Urethan.	Mols. per cent Acetamide.	t°.	Gms. acetamide per 100 gms. *p* Toluidine.	Mols. per cent Acetamide.
40...	65.7	49.8	40...	27.2	33.0
60...	179.2	73.0	60...	85.5	60.8
70...	295.8	87.1	70...	213.8	79.5

Freezing-point lowering data are given for mixtures of Acetanide and each of the Following Compounds :

Acetic acid (Kremann, Mauerman and Ostwald, 1923.)
Acetic anhydride (Kremann, Mauerman and Ostwald, 1923.)
Nitroso dimethyl aniline (Kremann and Wlk, 1919.)
Benzoic acid (Kremann, Mauerman and Ostwald, 1923.)
Benzoic anhydride (Kremann, Mauerman and Ostwald, 1923.)
o, *m* and *p* Dioxybenzene (Kremann and Auer, 1918.)
o Oxybenzoic acid (Kremann and Auer, 1918.)
α and β Naphthol (Kremann and Auer, 1918.)
o, *m* and *p* Nitrophenol (Kremann and Auer, 1918.)
Phenol (Kremann and Wenzing, 1917.)
Phenol + C_2H_5OH (Kremann and Wenzing, 1917.)
Pyrogallol (Kremann and Zechner, 1918.)
Salicylic acid (Rheinboldt, Henning and Kircheisen, 1925.)

ACETANILIDE $C_3H_5NH.COCH_3$.

Solubility of Acetanilide in Water. (Shoorl and de Weerd, 1922.)

t°.	Gms. $C_6H_5NH.COCH_3$ per 100 gms. sat. sol.	Solid Phase.
—0.03 (Eutec.)	0.5	Ice + $C_6H_5NH.COCH_3$
15.....	0.5 (0.4)*	$C_6H_5NH.COCH_3$
20.....	0.52(0.45)	»
30.....	0.63(0.51)	»
40.....	0.86(0.65)	»
50.....	1.25(0.81)	»
60.....	2.0	»
70.....	3.0	»
80.....	4.5	»
83.2.....	5.2 Quad. pt.	» + liquid layers
83.2.....	87.0	» »
85.....	91.0	$C_6H_5NH.COCH_3$
90.....	94.5	»
95.0.....	96.5	»
100.0.....	98.0	»
114.0.....	100.0 m. pt.	»

The liquid layers which separate above 83°.2 have the following composition.

t°.	Gms. $C_6H_5NH.COCH_3$ per 100 gms. H_2O rich layer.	Gms. $C_6H_5NH.COCH_3$ per 100 gms. $C_6H_5NH.COCH_3$ rich layer.
83.2....	5.2	87.0
90.0....	5.8	82.5
100.0....	6.5	80.5
120.0....	13.0	79.0
130.0....	18.0	73.0
135.0....	22.0	69.0
140.0....	28.0	63.0
142.0....	30.0	60.0
144.0 (crit. t.)	45.0	

* These results, which are probably low, are given by Oliveri-Mandala and Forni, 1925.

Solubility of Acetanilidine in Aqueous Solutions of Antipyrine and of Pyramidone. (Oliveri-Mendala and Forni, 1925.)

Results for Antipyrine solutions at 10°. Gms. per 100 gms. sat. sol.		Results for Antipyrine solutions at 20°. Gms. per 100 gms. sat. sol.		Results for Pyramidone solutions at 14°. Gms. per 100 gms. sat. sol.		Results for Pyramidone solutions at 25°. Gms. per 100 gms. sat. sol.	
Antipyrine.	Acetanilide.	Antipyrine.	Acetanilide.	Pyramidone.	Acetanilide.	Pyramidone.	Acetanilide.
0.5	0.45	0.5	0.526	0.5	0.43	0.5	0.699
1.0	0.50	1.0	0.597	1.0	0.45	1.0	0.715
2.0	0.55	2.0	0.712	2.0	0.49	2.0	0.750
4.0	0.77	4.0	0.900	2.495	0.51	2.495	0.761
5.0	1.03	5.0	1.043	4.0	0.57	4.0	0.908
10.0	1.64	10.0	1.690				

100 cc. of aqueous 10.1 per cent sodium salicylate solution dissolve 0.848 gm. acetanilide, and 100 cc. of aqueous 13.9 per cent solution dissolve 0.92 gm. at 20°. (Oliveri-Mandala. 1926.)

Solubility of Acetanilide in Several Solvents.

Solvent.	t°.	Gms. $C_6H_5NH.COCH_3$ per 100 gms. solvent.	Authority.
Glycerol (Density 1.2326).....	20	0.93	(Holm, 1921, 1922.)
» (» 1.2645).....	20	1.15	»
Paracymene (b. pt. 176–176.5).....	30	7.23	(Wheeler, 1920.)
Ethylalcohol (com. absolute).....	20–23	21.3	(Pucher and Dehn, 1921.)
Quinoline.....	»	12.67	»
» + C_2H_5OH (Equimol. mixture).	»	23.69	»

SOLUBILITY IN METHYLALCOHOL, ETHYLALCOHOL AND IN CHLOROFORM.
(Speyers, 1902; see Note, p. 1001.)

	In CH_3OH.		In C_2H_5OH.		In $CHCl_3$.	
t°.	Sp. Gr. of sat. solution.	Gms. $C_6H_5NH.COCH_3$ per 100 gms. CH_3OH.	Sp. Gr. of sat. solution.	Gms. $C_6H_5NH.COCH_3$ per 100 gms. C_2H_5OH.	Sp. Gr. of sat. solution.	Gms. $C_6H_5NH.COCH_3$ per 100 gms. $CHCl_3$
0...	0.860	24.0	0.842	15.5	1.503	3.9
10...	0.864	30.0	0.844	20.0	1.475	7.5
20...	0.875	42.0	0.850	28.0	1.440	13.0
30...	0.892	62.0	0.860	38.0	1.398	20.0
40...	0.911	90.0	0.874	54.0	1.354	29.0
50...	0.932	137.0	0.895	78.0	1.314	43.0
60...	0.957	215.0	0.920	120.0	1.272	65.0

SOLUBILITY OF ACETANILIDE IN PHENOL, URETHAN AND IN TOLUENE. (Mortimer, 1923.)

	In Phenol.		In Urethan.		In Toluene.	
t°.	Mol. % $C_6H_5NHCOCH_3$ in sat. sol.	Gms. $C_6H_5NHCOCH_3$ per 100 gms. C_6H_5OH.	Mol. % $C_6H_5NHCOCH_3$ in sat. sol.	Gms. $C_6H_5NHCOCH_3$ per 100 gms. $NH_2CO_2C_2H_5$.	Mol. % $C_6H_5NHCOCH_3$ in sat. sol.	Gms. $C_6H_5NHCOCH_3$ per 100 gms. $C_6H_5CH_3$.
0...	....	.....	....	.....	0.15	0.22
20...	....	.....	....	.....	0.37	0.54
40...	42.7	107.0	14.8	26.3	1.1	1.63
60...	50.1	144.2	27.4	57.2	5.6	8.69
80...	60.5	220.1	46.8	133.2	33.8	74.85
100...	79.5	557.2	75.7	472.1	70.8	355.50

Freezing-point lowering data are given for mixtures of acetanilide and benzoic acid by (Pushin and Wilowitsch, 1925) and for mixtures of acetanilide and phenacetine by Kitran, 1924.

p Acetoxy **ACETANILIDE**, $CH_3CO.OC_6H_4NHCOCH_3$ *p*.

100 cc. of sat. solution in water contain 0.239 gms. $CH_3CO.OC_6H_4NHCOCH_3$ at 25°.
100 cc. of sat. solution in chloroform contain 3.25 gms. » »
(Emery and Wright, 1921.)

Data for the distribution of *p* acetoxyacetanilide between water and chloroform are also given by Emery and Wright, 1921.

Chlor**ACETANILIDES**, $Cl.C_6H_4NH.COCH_3$ *o*, *m* and *p*.

SOLUBILITY OF EACH IN WATER (Sidgwick and Rubie, 1924.)

NOTE. — The determinations were made by the synthetic method. Sealed bulbs of 2 or 3 cc. capacity were used at the higher temperatures and a Beckmann apparatus at the lower temperatures. Those points at which the solid phase separated are marked with an asterisk, the others show the composition of one of the two liquid layers which are formed. The triple point was determined in all cases but not the critical temperature of the liquid layers.

Ortho Chloracetanilide.		Meta Chloracetanilide.		Para Chloracetanilide.	
t°.	Gms. $Cl.C_6H_4NH.COCH_3$ per 100 gms. sat. sol.	t°.	Gms. $Cl.C_6H_4NH.COCH_3$ per 100 gms. sat. sol.	t°.	Gms. $Cl.C_6H_4NH.COCH_3$ per 100 gms. sat. sol.
86.7....	100.0*	76.6....	100.0*	178.4....	100.0*
77.0....	97.4*	69.0....	98.0*	168.0....	97.38*
70.0....	95.0* tr. pt.	64.0....	96.82*	150.0....	93.16*
105.0....	92.87	59.5....	95.0* tr. pt.	138.0....	90.0* tr. pt.
150.0....	88.72	81.0....	94.41	142.0....	89.6
175.0....	85.12	123.0....	91.29	160.0....	88.08
182.0....	10.71	165.0....	86.86	178.0....	85.23
155.....	6.63	176.....	6.14	169.0....	3.85
142.....	5.13	138.....	2.76	140.....	1.87*
105.....	2.94	130.....	2.49	115.....	0.837*
65.....	0.692*	76.....	0.743	97.....	0.384*
15.....	0.323*			65.5....	0.095*

Solubility of Ortho, Meta and Para Chloracetanilides in Benzene.

(Sidgwick and Rubie, 1921.)

The synthetic method was used. A solid phase separated in each case.

Ortho Chloroacetanilide.		Meta Chloroacetanilide.		Para Chloroacetanilide.	
t°.	Gms. $Cl.C_6H_4NH.COCH_3$ per 100 gms. sat. sol.	t°.	Gms. $Cl.C_6H_4NH.COCH_3$ per 100 gms. sat. sol.	t°.	Gms. $Cl.C_6H_4NH.COCH_3$ per 100 gms. sat. sol.
84.8.....	97.45	76.6.....	100.0	178.4.....	100.0
80.0.....	92.16	70.0.....	92.74	172.0.....	93.62
69.5.....	79.53	61.0.....	81.20	162.0.....	78.50
61.4.....	68.22	51.5.....	68.17	154.5.....	69.67
50.5.....	52.06	46.0.....	59.51	144.2.....	55.86
45.2.....	41.69	39.5.....	47.31	134.5.....	37.80
37.8.....	30.65	29.2.....	32.81	125.2.....	21.14
31.4.....	21.77	15.4.....	20.04	122.4.....	18.16
20.2.....	13.50			107.5.....	6.63
10.0.....	9.56			96.5.....	4.21

100 cc. of water dissolve approx. 1.33 gms. *o* chloro, *o* nitroacetanilide at ord. temp.

» » » 1.11 » *o* » *p* » »

100 cc. of dil. acid* » 1.55 » *o* » *o* » »

» » » 1.55 » *o* » *p* » »

* The dilute acid contained 14.4 cc. HNO_3 and 7.7 cc. CH_3COOH per 100 cc. (Franzel and Engel, 1921.)

NitroACETANILIDES $NO_2C_6H_4NHCOCH_3$, *o*, *m* and *p*.

Solubility of Each in Water. (Sidgwick and Rubie, 1921.)

The synthetic method was used. Both the triple points and the critical solution temperatures, for the two liquid layerers which separate, were determined. Asterisks indicate that a solid phase is present.

Ortho Nitroacetanilide.		Meta Nitroacetanilide.		Para Nitroacetanilide.	
t°.	Gms. $NO_2C_6H_4NHCOCH_3$ per 100 gms. sat. sol.	t°.	Gms. $NO_2C_6H_4NHCOCH_3$ per 100 gms. sat. sol.	t°.	Gms. $NO_2C_6H_4NHCOCH_3$ per 100 gms. sat. sol.
93.4.....	100.0*	154.5.....	100.0*	215.9.....	100.0*
92.4.....	99.38*	129.2.....	93.57*	192.2.....	95.2*
83.2.....	97.11*	124.2.....	91.72	163.6.....	81.84*
81.0.....	96.0* tr. pt.	118.5.....	90.0* tr. pt.	161.5.....	80.0* tr. pt.
99.0.....	94.54	149.2.....	81.18	171.7.....	65.84
110.2.....	93.65	166.4.....	73.74	176.6.....	54.93
173.1.....	83.47	175.7.....	66.08	178.0.....	50 crit. temp.
188.0.....	76.28	180.0.....	50 crit. temp.	177.4.....	42.65
195.0.....	65.04	176.9.....	31.13	172.8.....	25.62
198.0.....	50 crit. temp.	163.5.....	14.52	164.2.....	14.36
197.0.....	41 16	130.0.....	5.21	156.5.....	7.08*
191.2.....	24.06			145.1.....	2.94
179.2.....	11.97				
157.6.....	8.04				
120.0.....	3.97				

Solubility of Ortho, Meta and Para Nitroacetanilides in Benzene.

(Sidgwick and Rubie, 1921.)

Ortho Nitroacetanilide.		Meta Nitroacetanilide.		Para Nitroacetnailide.	
t°.	Gms. $NO_2C_6H_4NHCOCH_3$ per 100 gms. sat. sol.	t°.	Gms. $NO_2C_6H_4NHCOCH_3$ per 100 gms. sat. sol.	t°.	Gms. $NO_2C_6H_4NHCOCH_3$ per 100 gms. sat. sol.
81.2.....	87.58	154.5.....	100.0	197.4.....	87.48
76.4.....	79.08	135.3.....	83.07	186.5.....	72.62
71.5.....	67.97	126.8.....	65.27	180.3.....	54.78
68.0.....	54.97	121.2.....	35.13	179.4.....	49.93
58.5.....	31.49	115.0.....	13.47	177.5.....	37.75
46.8.....	16.44	102.0.....	5.04	172.6.....	17.47
39.0.....	10.26			150.6.....	5.23

Solubility of Ortho and of Para Nitroacetanilide in Water and in Aqueous Solutions of Acetic and Nitric acids at Ordinary Temperature.

(Franzel and Engel, 1921.)

	Acetanilide.	Solvent.	Gms. Acetanilide per 100 cc. solvent.
o	Nitroacetanilide	Water	0,22
o	»	Water containing 9.1 cc. CH_3COOH per 100 cc	1.04
o	»	» 15.9 cc. HNO_3 per 100 cc	0.96
o	»	» 7.7 cc. acetic + 14.4 cc. HNO_3 per 100 cc.	0.89
p	»	Water	0.22
p	»	Water containing 7.7 cc. acetic + 14.4 cc. HNO_3 per 100 cc.	0.89

Freezing-point lowering data (see foot-note, p. 1001) are given for the following pairs of compounds :

2.4	dibromoacetanilide	+ 2	chloro 4 bromoacetanilide	(Owen, 1923.)
4	chloro 2 bromoacetanilide	+	»	»
2.4	dibromoacetanilide	+ 4	chloroacetanilide	»
2	chloroacetanilide	+	»	(Orton and Owen, 1924.)
1.2.4	chloronitroacetanilide	+ 1.2.6	chloronitroacetanilide	de Bruyn, 1917.)
1.3.4	»	+ 1.3.6	»	»

ACETIC ACID CH_3COOH.

Solubility in Aqueous Solutions of Epichlorhydrine.

(Leone and Benelli, 1921.)

The authors give data for the system $H_2O + CH_3CO\,OH + CH_2.O.CH\,CH_2Cl$. As a part of this study they determined the temperature of clearing and of clouding when weighed amounts of acetic acid were added to aqueous solutions of epichlorhydrine of definite weight per cent concentrations. These results when plotted on cross-section paper yield straight lines from which the following figures were read. At temperatures above 80° the epichlorhydrine begins to react with the water. For other data on this system see pages 1195 and 1196.

	Gms. $CH_3CO\,OH$ per 100 gms. saturated solution in aqueous :				
t°.	9.97 % C_3H_5OCl.	20.05 % C_3H_5OCl.	39.77 % C_3H_5OCl.	59.66 % C_3H_5OCl.	89.64 % C_3H_5OCl.
10.....	13.1	25.5	29.9	29.2	17.9
20.....	11.2	23.6	28.2	27.5	16.5
30.....	9.2	21.7	26.5	25.9	15.0
40.....	7.3	19.8	24.8	24.2	13.6
50.....	5.4	17.9	23.2	22.5	12.2
60.....	3.5	16.0	21.5	20.9	10.7
70.....	1.6	14.1	19.8	19.2	9.3
80.....	0.0	12.2	18.2	17.5	7.9

Solubility of Acetic Acid in Cotton Seed Oil and in Kerosene and Vice Versa. (Gordon and Reid, 1922.)

The mixtures were constantly shaken at 25° for four hours. After separation of the two layers the acetic acid in weighed amounts of each was determined by titration. The weight of oil was calculated by difference.

100 gms.	Cotton Seed Oil	dissolve	55.7	gms. CH_3COOH at 25°
»	Kerosene	»	21.77	gms. »
»	Anhydrous acetic acid	»	5.6	gms. Cotton Seed Oil at 25°
»	»	»	12.5	gms. Kerosene at 25°

Solubility of Acetic Acid in Carbon Disulfide, Cyclohexane and in Petroleum. (Jones, 1923.)

The synthetic method was used and attention was directed particularly to the region of the critical solution temperature. The author was interested in the effect of small amounts of water upon the critical solution temperature and the use of this data as a criterion of purity of acetic acid. In addition to the results for pure acetic acid he gives data for the change in C. S. T. caused in each case by increasing amounts of water.

$CH_3COOH + CS_2$.		$CH_3COOH + C_6H_{12}$.		CH_3COOH + Petroleum (b. pt. 185°-195°).	
Miscibility temp.	Gms. CH_3COOH per 100 gms. sat. sol.	Miscibility temp.	Gms. CH_3COOH per 100 gms. sat. sol.	Miscibility temp.	Gms. CH_3COOH per 100 gms. sat. sol.
0.5	19.6	1.0	34.5	22 9	25.54
3.9*	42.7	3.2	42.3	36.2	26.92
2.9	56.1	4.2*	54.6	47.2	41.0
2 6	24.6	2.8	67.03	49.85	52.72
3.9	49.3	—2.8	76.0	50.15*	56.91
—5.2	66.1			50.5*	65.57
				48.9	73.5
				39.6	82.51
				25.6	88.51

* Denotes critical solution temp.

Distribution of Acetic Acid Between:

Water and Benzene at 25° (Brown and Bury, 1923.)

Gms. mols. CH_3COOH per liter of	
H_2O layer.	C_6H_6 layer.
0.531	0.0125
0.633	0.0165
1.148	0.0443
1.510	0.0714
1.858	0.1015
2.976	0.224
4.743	0.486
5.444	0.614
6.101	0.739
7.546	1.089
8.710	1.463
10.812	2.692
11.137	3.111

Water and Epichlorhydrine at 10° (Leone and Benelli, 1922.)

Gms. CH_3COOH per 100 gms. of		$\frac{a}{b}$.
upper layer (*a*).	lower layer (*b*).	
3.47	1.07	3.22
6.71	2.29	2.93
9.47	3.59	2.63
12.02	5.00	2.40
16.58	7.72	2.17
20.00	10.00	2.00
23.70	13.21	1.75
26.43	16.59	1.63
27.45	18.00	1.52
29.25	21.83	1 34
30.10	23.33	1.29
29.07	24.97	1.16
28.50	25.33	1.12

Distribution of Acetic Acid Between Water and Ethylether. (Löfman, 1919.)

The author points out the discrepancies in previous determinations. In his experiments equal volumes of the two liquids were shaken together for one-half hour at constant temperature and each layer analyzed by titration, using phenolphthalein as indicator. Acetic acid forms double molecules in ether.

t°.	Gms. mols. CH_3COOH per liter. H_2O layer (C_1).	Ether layer (C_2).	$\frac{C_1}{C_2}$.	t°.	Gms. mols. CH_3COOH per liter. H_2O layer (C_1).	Ether layer (C_2).	$\frac{C_1}{C_2}$.
0...	0 01273	0.00684	1.86	25...	0.01323	0.006097	2.17
0...	0.03122	0.01667	1.87	25...	0.03309	0.01528	2.17
0...	0.06292	0.03401	1.85	25...	0.06654	0.0311	2.14
0...	0.1262	0.06971	1.81	25...	0.1341	0.06355	2.11
0...	0.3130	0.1809	1.73	25...	0.3265	0.1624	2.01
0...	0.6230	0.3829	1.62	25...	0.6497	0.3406	1.91
0...	1.1930	0.8145	1.45	25...	1.2600	0.7413	1.70

Similar determinations are also given for 5°, 10°, 15° and 20°. — Additional data at 15° are given by Pinnow, 1922; at 20-22° by Behrens, 1926; at 25° by Smith 1921-2.

Distribution of Acetic Acid Between Aqueous Sodium Acetate Solutions and Ethylether at 20°. (Löfman, 1919.)

Distribution Coefficient $\frac{C_1}{C_2}\left(\frac{\text{G. M. } CH_3COOH \text{ per liter Aq. layer}}{\text{G. M. } CH_3COOH \text{ per liter Ether layer}}\right)$ in

Concentration of CH_3COOH.	0.0 normal CH_3COONa ($=H_2O$).	1.0 normal CH_3COONa sol.	2.0 normal CH_3COONa sol.	3.0 normal CH_3COONa sol.
0.0200 normal..	2.10	2.07	2.15	2.25
0.03125 » ..	2.10	2.15	2.15	2.25
0.0625 » ..	2.09	2.23	2.24	2.34
0.125 » ..	2.04	2.25	2.24	2.36
0.25 » ..	2.00	2.20	2.30	2.42
0.50 » ..	1.92	2.16	2.21	2.33
1.00 » ..	1.71	1.97	2.17	2.27
2.00 » ..	1.45	1.70	2.00	2.18

Distribution of Acetic Acid at 25° Between:

(Gordon and Reid, 1922.)

Water and Cotton Seed Oil.				Water and Kerosene.	
Gms. CH_3COOH per 100 gms.		Gms. CH_3COOH per 100 gms.		Gms. CH_3COOH per 100 gms.	
H_2O layer.	C. S. oil layer.	H_2O layer.	C. S. oil layer.	H_2O layer.	Kerosene layer.
1.9	0.0525	12.7	0.435	46.9	2.34	9.1	0.0676
2.1	0.0544	14.1	0.494	50.9	2.76	17.0	0.189
2.4	0.0698	16.1	0.583	62.1	3.94	27.2	0.445
7.5	0.239	28.9	1.22	70.2	5.37	46.9	1.145
8.2	0.267	31.8	1.34	81.8	9.70	59.2	1.915

Distribution of Acetic Acid Between Water and Toluene at 25°.

(Woodman, 1926.)

Mixtures of weighed amounts of water and toluene were titrated with glacial acetic acid untill only a slight turbidity remained after shaking. The mixture was then placed in a thermostat and the titration continued to homogeneity.

Gms. per 100 gms. sat. solution.		Gms. per 100 gms. sat. solution.		Gms. per 100 gms. sat. solution.		Gms. per 100 gms. sat. solution.	
H_2O.	$C_6H_5CH_3$.	H_2O.	$C_6H_5CH_3$.	H_2O.	$C_6H_5CH_3$.	H_2O.	$C_6H_5CH_3$.
0.4721	81.3979	10.82	22.34	14.50	14.62	25.30	5.454
1.474	66.866	11.53	19.89	16.00	12.54	25.80	5.308
2.966	55.124	11.93	19.30	17.10	11.32	26.52	5.02
4.594	45.84	12.02	19.48	18.00	10.29	28.13	4.446
4.689	44.72	12.38	18.37	20.08	8.662	33.42	2.975
6.871	35.38	12.83	17.43	21.76	7.415	43.89	1.419
8.507	29.27	12.98	17.53	23.23	6.342	57.597	0.6533
9.809	25.28	13.56	16.07	24.34	5.97	67.8344	0.2856

In order to locate the points (tie lines) corresponding to upper and lower liquid layers, mixtures of the three components, yielding two layers, were brought to equilibrium in a thermostat and measured volumes of each layer weighed and titrated for acetic acid. The following results were obtained.

Aqueous layer.		Toluene layer.		Aqueous layer.		Toluene layer.	
d_4^{25}.	wt. % CH_3COOH.	d_4^{25}.	wt. % CH_3COOH.	d_4^{25}.	wt. % CH_3COOH.	d_4^{25}.	wt. % CH_3COOH.
1.025	21.38	0.8614	1.374	1.049	67.70	0.8847	18.55
1.035	30.87	0.8630	2.797	1.044	69.71	0.8846	21.50
1.042	37.69	0.8650	4.072	1.039	70.55	0.8952	24.88
1.050	47.50	0.8676	6.363	1.024	69.85	0.9099	32.96
1.054	58.05	0.8730	10.35	1.006	66.68	0.9276	40.64
1.052	64.86	0.8796	14.98	0.9757	58.46	0.9588	53.07

Distribution of Acetic Acid Between Acetone and Glycérol at 25°.

(Smith, 1921-22.)

Millimols. CH_3COOH per liter in			Millimols. CH_3COOH per liter in		
Glycerol layer (G).	Acetone layer (A).	$\frac{A}{G}$.	Glycerol layer (G).	Acetone layer (A).	$\frac{A}{G}$.
0.9425	1.725	1.83	3.875	7.00	1.81
1.00	1.825	1.82	4.60	8.20	1.78
1.60	3.025	1.80	4.85	8.60	1.77
2.77	4.70	1.70	10.00	17.60	1.76
2.775	4.775	1.72	17.30	29.30	1.69

Data for the distribution of mixtures of *Acetic Acid* and *Hydrogen Peroxide* between water and amyl alcohol, and between water and ether are given by Perschke and Tschufaroff, 1926. They also give results for the distribution of these compounds determined separately, which agree with those of Herz and Fischer, 1904-05, and Calvert 1901 (See « Solubilities », pages 6 and 321).

Reciprocal Solubility of Acetic Acid and Aniline.

(O' Connor, 1921.)

The freezing-point method could not be used in all cases and saturated solutions in contact with large amounts of solid at definite temperatures were prepared. These were analyzed by titrating the acetic acid in weighed portions and calculating the aniline by difference. The determinations were plotted and the following results read from the curve.

t°.	Mols. CH_3COOH per 100 mols. sat. sol.	Solid Phase.	t°.	Mols. CH_3COOH per 100 mols. sat. sol.	Solid Phase.
16.6....	100.0	CH_3COOH	16.7 (crit. t.)	67.0	$C_6H_5NH_2.2CH_3COOH$
15.0....	97.0	»	10.0....	46.5	»
10.0....	91.5	»	5.0....	38.7	»
5.0....	88.2	»	0.0....	32.2	»
0.0....	85.5	»	— 5.0....	27.0	»
— 2.4 tr. pt.	84.2	$CH_3COOH+C_6H_5NH_2.2CH_3COOH$	—10.0....	22.5	»
— 5.0....	83.5	CH_3COOH (unstable)	—15.6 tr. pt..	18.2	» $+C_6H_5NH_2$
—10.0....	81.8	» »	—17.0....	17.5	$C_6H_5NH_2.2CH_3COOH$ (unstable)
—15.0....	80.4	» »	—20.0....	40.0	$C_6H_5NH_2$ (unstable)
—18.2....	79.7	» »	—17.5....	22.0	» »
— 8.0....	85.5	$C_6H_5NH_2.2CH_3COOH$ (unstable)	—15.0....	16.5	»
— 5.0....	84.7	» »	—12.5....	11.0	»
0.0....	83.3	»	—10.0....	6.5	»
+ 5.0....	81.5	»	— 7.5....	2.2	»
10.0....	79.0	»	— 6.0....	0.0	»

Solubility data determined by the freezing-point method (see foot-note, p. 1001) are given for each of the following mixtures :

Acetic acid + Aniline (Kremann, Weber and Zechner, 1925.)
» + Dimethylaniline (O'Connor, 1924.)
» + Azobenzene (Kremann and Zechner, 1925.)
» + Benzamide (Kremann, Mauermann and Ostwald, 1923.)
» + Mesidine (O'Connor, 1924.)
» + Mercuric acetate (Mameli and Cocconi, 1922.)
» + Mercuric acetate + Phenol (Mameli and Cocconi, 1922.)
» + Phenol (Mameli and Cocconi, 1922.)
» + α and β Naphthylamine (Kremann, Weber and Zechner, 1925.)
» + *o*, *m* and *p* Propylene diamine (Kremann, Weber and Zechner, 1925.)
» + Sodium acetate (Kendall and Adler, 1921.)
» + *o*, *m* and *p* Toluidine (O'Connor, 1924.)
» + *p* Toluidine (Kremann, Weber and Zechner, 1925.)
» + Urea (Kremann, Weber and Zechner, 1925.)

DISTRIBUTION OF ISO AMYLACETIC ACID BETWEEN WATER AND XYLENE AT 25°. (Smith, 1921-1922.)

Millimols. *iso* $C_5H_{11}.CH_2.COOH$ per liter of		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	Xylene layer (C_2).	
0.0792	0.858	10.85
0.212	2.170	10.25
0.375	3.625	9 67
0.85	7.95	9.37

BromACETIC ACID $CH_2.Br.COOH$.

DISTRIBUTION OF BROMACETIC ACID AT 25° BETWEEN: (Smith, 1921-1922.)

Water and Chloroform.

Millimols. $CH_2BrCOOH$ per liter of		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	
9.40	0.45	0.0478
14.45	0.75	0.0519
18.45	1.05	0.0570
32.00	2.08	0.065

Water and Ether.

Millimols. $CH_2BrCOOH$ per liter of		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	
0.9625	1.3375	1.390
1.3125	1.8875	1.438
1.475	3.475	1.760
3.05	6.30	2.063
4.25	9.55	2.245

Water and Xylene.

Millimols. $CH_2BrCOOH$ per liter of		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	Xylene layer (C_2).	
23.30	0.70	0.0300
26.70	0.90	0.0337
37.40	1.15	0.0325

Acetone and Glycerol.

Millimols. $CH_2BrCOOH$ per liter of		$\frac{A}{G}$.
Acetone layer (A).	Glycerol layer (G).	
2.00	0.645	3.10
4.70	1.60	2.94
7.25	2.25	3.22
14.20	4.35	3.26

ChlorACETIC ACIDS $CH_2ClCOOH$, $CHCl_2COOH$, CCl_3COOH.

DISTRIBUTION OF MONO CHLORACETIC ACID BETWEEN WATER AND ETHER AT:

18° (Schreiner, 1922.)

Concentration of $CH_2ClCOOH$ in		$\frac{C_2}{C_1}$.
H_2O layer.	Ether layer.	
0.0103	0.0206	1.08
0.0165	0.0348	1.299
0.0260	0.0571	1.66
0.0320	0.0760	1.718
0.0492	0.118	1.770

25° (Smith, 1921-1922.)

Concentration of $CH_2ClCOOH$ in		$\frac{C_2}{C_1}$.
H_2O layer.	Ether layer.	
0.0761	0.181	1.08
0.150	0.390	1.299
0.169	0.452	1.66
0.290	0.795	1.718
0.430	1.200	1.770

Millimols. $CH_2ClCOOH$ per liter in

H_2O layer (C_1).	Ether layer (C_2).	$\frac{C_2}{C_1}$.
1.40	1.55	1.08
2.85	3.70	1.299
5.11	8.48	1.66
7.80	13.40	1.718
8.58	15.20	1.770

Schreiner also gives results for the distribution in presence of sodium monochlor acetate.

DISTRIBUTION OF MONO CHLORACETIC ACID AT 25° BETWEEN: (Smith, 1921-1922.)

Water and Chloroform.

Millimols. $CH_2ClCOOH$ per liter of		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	
42.75	0.625	0.0146
68.25	1.250	0,0183
86.50	1.6875	0.0195
199 00	5.50	0.0276
194.25	5.50	0.0283

Acetone and Glycerol.

Millimols. $CH_2ClCOOH$ per liter in		$\frac{A}{G}$.
Acetone layer (A).	Glycerol layer (G).	
1.30	0.325	4.00
3.90	0.975	4.00
8.60	2.00	4.30
15.925	3.125	4.60
29.25	6.15	4.76

DISTRIBUTION OF DI CHLORACETIC ACID AT 25° BETWEEN: (Smith, 1921-1922.)

Water and Ether.

Millimols. $CHCl_2COOH$ per liter of		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	
1.25	1.025	0.82
2.325	2.675	1.15
4.05	6.95	1.72
6.5	14.8	2.28
9.5	25.9	2.72

Acetone and Glycerol.

Millimols. $CHCl_2COOH$ per liter of		$\frac{A}{G}$.
Acetone layer (A).	Glycerol layer (G).	
0.830	0.43	1.93
2.20	0.61	3.61
4.625	0.925	5.02
9.725	1.375	7.07
17.8	1.90	19.38
37.9	2.40	15.8

DISTRIBUTION OF TRI CHLORACETIC ACID AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Ether. Millimols. CCl_3COOH per liter of			Acetone and Glycerol. Millimols. CCl_3COOH per liter of		
H_2O layer (C_1).	Ether layer (C_2).	$\frac{C_2}{C_1}$.	Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
1.95	0.85	0.436	1.50	0.600	2.50
3.20	2.50	0.781	2.8375	0.7625	3.72
5.10	5.40	1.060	5.40	1.075	5.02
7.10	10.40	1.465	7.70	1.25	6.17
8.825	17.00	1.928	20.90	1.70	12.30

Freezing-point lowering data (Solubilities, see foot-note, p. 1001) are given by Mameli and Cocconi, 1923 for mixtures by Monochlor acetic acid and each of the following compounds : Phenol, *o*, *m* and *p* Cresol, Guaicol, α and β Naphthol and Thymol. Similar data are given by Kremann and Zechner, 1925, for mixtures of Dichloracetic acid and Azobenzene and for Trichloracetic acid and Azobenzene. Kitran, 1924, gives freezing-point lowering data for mixtures of Trichlor acetic acid and each of the following compounds : Camphor, Diphenylamine, β Naphthylamine, Quinol, Pyrocatechol, Naphthalene, Pyrogallol, Resorcinol, *p* Toluidine and Urethan.

PhenylACETIC ACID (α Toluic Acid) $CH_2(C_6H_5).COOH$.

SOLUBILITY IN WATER AND IN BENZENE, DETERMINED BY THE SYNTHETIC METHOD (Sidgwick and Ewbank, 1921 *a*.)

In Water.			In Benzene.		
t°.	Gms. $CH_2(C_6H_5)COOH$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $CH_2(C_6H_5)COOH$ per 100 gms. sat. sol.	Solid Phase.
76.7.....	100.0	$CH_2(C_6H_5)COOH$	59.0.....	81.03	$CH_2(C_6H_5)COOH$
48.5.....	80.96	»	42.0.....	61.28	»
45.5 tr. pt.	—	» + liquid layer	29.0.....	42.98	»
94.8.....	61.94	liquid layers	13.0.....	28.00	»
106.8.....	39.69	»	3.0.....	19.93	»
108.0 crit. t.	—	»	2.2.....	16.30	C_6H_6
108.0.....	20.0	»	3.2.....	13.04	»
84.7.....	5.65	»	4.6.....	6.22	»

SOLUBILITY OF PHENYACETIC ACID AND OF DIPHENYLACETIC ACID IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°. (Knox and Richards, 1919.)

Results for Phenylacetic Acid.				Results for Diphenylacetic Acid.			
Gm. mols. per liter.		Gms. mols. per liter.		Gm. mols. per liter.		Gm. mols. per liter.	
HCl.	$CH_2(C_6H_5)$ .COOH.	HCl.	$CH_2(C_6H_5)$ .COOH.	HCl	$CH(C_6H_5)_2$ .COOH.	HCl.	$CH(C_6H_5)_2$ .COOH.
0.0	0.01310	7.175	0.0756	0.0	0.00060	7.349	0.00041
1.417	0.0984	8.580	0.0815	1.620	0.00047	8.889	0.00042
2.890	0.0833	9.988	0.0916	2.913	0.00040	10.27	0.00046
4.313	0.0763	11.36	0.1099	4.512	0.00036	11.74	0.00053
5.770	0.0739			5.972	0.00038		

DISTRIBUTION OF PHENYLACETIC ACID AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Chloroform. Millimols. $CH_2(C_6H_5)COOH$ per liter of :			Water and Ether. Millimols. $CH_2(C_6H_5)COOH$ per liter of :		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.280	0.475	1.70	0.085	1.255	14.7
0.425	0.785	1.845	0.17	2.47	14.5
0.518	1.010	1.95	0.26	3.82	14.7
0.715	1.542	2.16	0.44	7.44	16.9
			1.08	16.12	15.0

DISTRIBUTION OF PHENYLACETIC ACID BETWEEN WATER AND XYLENE AT 25°.
(Smith, 1921-1922.)

Results using :

1 vol. H_2O to 1 vol. Xylene.			1 vol. H_2O to 2 vols Xylene.			2 vols. H_2O to 1 vol. Xylene.		
Millimols. $CH_2(C_6H_5)COOH$ per liter of			Millimols. $CH_2(C_6H_5)COOH$ per liter of			Millimols. $CH_2(C_6H_5)COOH$ per liter of		
H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.
1.26	0.5750	0.456	1.400	1.275	0.910	1.18	0.175	0.148
1.60	0.7750	0.484	2.250	2.400	1.068	1.75	0.35	0.200
2.60	1.5375	0.592	2.875	3.325	1.16	2.58	0.85	0.330
3.50	2.473	0.708	3.575	4.825	1.35	4.90	3.05	0.623
5.00	5.00	1.00						

Freezing-point lowering data (see foot-note, p. 1001) are given for mixtures of Phenylacetic acid and dianisalacetone, phenylacetic acid and dibenzylacetone and for phenylacetic acid + Michler's Ketone by Pfeiffer, 1924.

PhosphonoACETIC ACID $HOOC.CH_2PO(OH)_2$.

100 gms. saturated solution in Water contain 64.5 gms. $HOOC.CH_2PO(OH)_2$ at 0°.
(Nylén, 1926.)

ACETIC ANHYDRIDE $(CH_3CO)_2O$.

Freezing-point lowering data (see foot-note, p. 1001) are given for :

Acetic anhydride + Benzamide (Kremann, Mauermann and Oswald, 1923.)
» + Piperonal (Jorissen and van der Beek, 1924.)

ACETONE $CH_3.CO.CH_3$.

MISCIBILITY OF ACETONE, *n* BUTYLALCOHOL AND WATER AT 20°.
(Reilly and Ralph, 1919.)

Exceedingly great care was exercised in purifying the materials. The Acetone was of $d_{\frac{20}{4}} = 0,79091$ and b. pt. 56°-56°.5. The *n* Butylalcohol had $d_{\frac{20}{4}} = 0,80953$ and b. pt. 117°.6 at 760mm. The densities of a complete series of mixtures of weighed amounts of Acetone, *n* Butylalcohol and water were determined at $\frac{20}{4}$ and the results plotted. The miscibility limits for *n* Butylalcohol and water were determined by bringing mixtures of the two liquids to equilibrium in a thermostat at 20° and calculating the composition of each layer from its density. In order to determine the miscibility of the three components, acetone was added from a buret to a mixture of slightly more *n* Butylalcohol than required to saturate a given amount of water, untill the cloudy mixture just became clear. From the increase in weight the relative amounts of *n* Butylalcohol, acetone and water were calculated. A series of these determinations located the boundary curve of the system.

Gms. per 100 gms. of mixture.			
n Butylalcohol.	Acetone.	Water.	$d_{\frac{20}{4}}$.
7.90	.....	92.10	0.9869
12.00	9.26	78.74	0.9670
18.64	11.62	69.74	0.9484
24.68	12.65	62.67	0.9340
28.15	12.95	58.90	0.9260
36.91	13.42	49.67	0.9071
47.02	13.10	39.88	0.8874
53.86	11.65	34.49	0.8764
63.68	8.28	28.04	0.8633
79.94	.....	20.06	0.8477

The authors also determined the contraction on mixing, and give tables showing the densities and contraction of mixtures of acetone and water and of *n* Butylalcohol and water.

The Ternary System Acetone, Toluene and Water.

(Walton and Jenkins, 1923.)

Definite amounts of water and toluene were mechanically stirred at constant temperature and acetone slowly added untill the mixture just cleared. The volumes of the liquids were read from burets. A series of such determinations gave the equilibrium line between the one-liquid phase and the two-liquid phase systems.

Results at 0° : Gms. per 100 gms. sat. sol.			Results at 20° : Gms. per 100 gms. sat. sol.			Results at 30° : Gms. per 100 gms. sat. sol.		
Water.	Toluene.	Acetone.	Water.	Toluene.	Acetone.	Water.	Toluene.	Acetone.
0.5	70.3	29.2	0.5	76.0	23.5	1.5	61.5	37.0
1.0	60.0	39.0	1.0	68.9	33.1	2.0	56.1	41.9
1.5	53.3	45.2	1.5	58.5	40.0	2.5	51.6	45.9
2.0	48.6	49.4	2.0	53.6	44.4	3.0	48.5	48.5
2.5	44.4	52.6	2.5	49.4	48.1	4.0	43.1	52.9
3.0	41.6	55.4	3.0	45.9	51.1	5.0	38.6	56.4
4.0	36.8	59.2	4.0	40.6	55.4	7.0	32.3	60.7
5.0	33.2	61.8	5.0	36.6	58.4	10.0	26.0	64.0
7.0	28.1	64.9	7.0	30.6	62.4	15.0	19.7	65.3
10.0	23.0	67.0	10.0	25.0	65.0	14.6	20.1	65.3*
13.0	19.4	67.6*	14.2	19.8	66.0*	20.0	15.5	64.5
15.0	17.5	67.5	15.0	19.0	66.0	25.0	12.2	62.8
20.0	13.6	66.4	20.0	14.9	65.1	28.7	10.0	61.3
25.0	10.0	64.9	25.0	11.5	63.5	34.3	7.0	58.7
30.0	7.1	62.9	30.0	8.5	61.5	39.0	5.0	56.0
34.6	5.0	60.4	35.0	6.0	59.0	42.1	4.0	53.9
37.4	4.0	58.8	37.6	5.0	57.4	46.0	3.0	51.0
41.0	3.0	56.0	40.5	4.0	55.5	50.8	2.0	47.2
45.6	2.0	52.4	43.8	3.0	53.2	54.4	1.5	44.1
48.8	1.5	49.7	48.3	2.0	49.7	59.4	1.0	39.6
53.5	1.0	45.5	57.0	1.0	42.0	68.3	0.5	31.2
61.0	0.5	38.5	65.0	0.5	34.3	71.5	0.4	28.1

* Maximum.

Mutual Solubility of Acetone and Glycerol. (Mc Ewen, 1923.)

The synthetic method of Alexejeff was used. The temperatures at which separation of liquid phases occurred in mixtures of known amounts of acetone and glycerol were determined.

t°.	Wt. per cent of Acetone.	t°.	Wt. per cent of Acetone.	t°.	Wt. per cent of Acetone.	t°.	Wt per cent of Acetone.
9.5...	10.90	90.9...	34.74	95.6*..	51.28	93.5...	64.47
44.8...	15.77	95.2...	44.67	95.7...	53,07	91.7...	67.42
66.6...	20.40	95.3...	45.75	95.6*..	55.34	81.3...	76.96
81.3...	26.58	95.3*..	46.31	95.5...	56.59	58.5...	86.93
85.3...	29.24	95.5*..	48.43	95.5...	57.25	40.0 ..	89.61

* Indicates critical opalescence.

Solubilities, Determined by Freezing-Point Lowering (see foot-note, p. 1001) for :

Acetone + Benzene.

(Yamamura, 1926.)

t°.	Mol. per cent Acetone.	t°.	Mol. per cent Acetone.
— 5...	21.3	—61...	81.8
—15...	38.4	—68...	84.2
—22...	46.7	—72...	86.0
—25...	52.0	—83...	89.1
—32...	59.5	—87...	89.9
—40...	69.1	—96...	96.6

Acetone + Hydrochloric Acide.

(Hirai, 1926.)

t°.	Mol. per cent HCl.	t°.	Mol. per cen HCl.
— 94.5...	0.0	—81.7...	45.12
—107.0...	14.43	—80.0...	52.91
—111.4...	20.50	—82.7...	55.56
—114.6...	27.29	—86.6...	57.26
—104.2...	31.78	—92.8. .	60.39
—85.7....	42.99		

Freezing-point lowering data (see foot-note, p. 1001) are given by Pfeiffer, 1924, for the following mixtures :

Dianisalacetone	+ α and β Naphthol.	Tetramethyldiaminodibenzylacetone	+ β Naphthylamine.
»	+ Benzoic acid.	»	+ *m* Nitraniline.
»	+ β Naphthylamine.	»	+ Neroline.
»	+ *m* Nitraniline.	Cinnamylidenbenzalacetone	+ Veronal. (Pfeiffer and Angern, 1926.)
»	+ Resorcinol.		
»	+ Neroline.		
Dibenzylacetone	+ α and β Naphthol.		
»	+ Resorcinol.		

***p* ACETOPHENETIDE** (Phenacetin) $C_2H_5O.C_6H_4NH.CH_3COO$.

100 cc. absolute ethylether dissolve 0.31—0.33 gms. $C_2H_5O.C_6H_4NH.CH_3COO$ at 25°.
» ether containing 3.6 % C_2H_5OH » 0.64—0.98 » »
» » less than 3 % » » 0.625 » »
(Taylor and Bebie, 1924.)

3.5 Dimethoxy**ACETOPHENETIDE** hydrate $C_{12}H_{17}O_4N.H_2O$.

SOLUBILITY IN WATER. (Bogert and Ehrlich, 1919.)

The freezing-point method was used up to 57° and the sealed tube method above this temperature and for the solubility of the liquid hydrate in water.

Results for the solid Hydrate.			Results for the liquid hydrate.		
	Gms. $C_{12}H_{17}O_4N.H_2O$ per 100 gms.	Mol. per cent $C_{12}H_{17}O_4N$.		Gms. $C_{12}H_{17}O_4N.H_2O$ per 100 gms.	Mol. per cent. $C_{12}H_{17}O_4N$.
t°.	H_2O.	H_2O.	t°.	H_2O.	H_2O.
21.8..	0.1444	0.010	68.5..	3.39	0.237
39.9..	0.288	0.020	58.1..	3.39	0.237
57.0..	0.6492	0.046	84.3..	3.68	0.257
69.5..	1.087	0.076	45.6..	3.68	0.257
72.8	1.297	0.091	99.8..	4.33	0.303
77.1..	1.716	0.120	35.6..	4.30	0.301
80.2..	2.152	0.151	111.1..	5.15	0.361
82.6..	2.582	0.180	118.4..	5.80	0.407
84.2..	2.897	0.203	129.2...	7.12	0.499
86.9..	3.685	0.257	173.6..	29.01	2.041

ACETOPHENONE $CH_3CO.C_6H_5$

MUTUAL SOLUBILITY OF ACETOPHENONE AND GLYCEROL. (Mac Ewen, 1923.)

The synthetic method of Alexejeff was used. The temperatures were determined at which separation of liquid phases occurred in mixtures of known amounts of acetophenone and glycerol.

t°.	Wt. per cent of $CH_3CO.C_6H_5$.	t°.	Wt. per cent of $CH_3CO.C_6H_5$.	t°.	Wt. per cent of $CH_3CO.C_6H_5$.
97.5....	4.38	184.0....	34.62	175.5...	75.07
136.5....	8.86	185.0*..	42.00	162.5...	83.42
164.0....	15.88	185.4*..	51.13	113.5...	95.30
174.5....	21.14	185.5*..	53.32	90.5...	97.13
		183.6...	61.90		

* Critical opalescence.

Freezing-point lowering data (see foot-note, p. 1001) are given for mixtures of **Acetophenone** and each of the following compounds by Kremann and Marktl, 1920.

Hydroquinol, α and β Naphthol, Phenol, *o*, *m* and *p* Nitrophenol, 1.2.4 Dinitrophenol, Picric acid, Pyrocatechol, Pyrogallol and Resorcinol.

Freezing-point lowering data are given for mixtures of *p* **Aminoacetophenone** and 1.2.4 Chlorodinitrobenzene (Giua, Marcellino and Curti, 1920), *a* Trinitrotoluene (Giua, 1917).

Freezing-point lowering data are given for mixtures of **Cinnamylidene acetophenone** and *p* Aminoacetophenone, *o* and *p* Chloronitrobenzene, *p* Bromonitrobenzene, *m* Dinitrobenzene, 1.2.4 Bromodinitrobenzene, Thymoquinone (Giua, 1925); Diphenylamine (Giua, 1917); Resorcinol (Pfeiffer, 1924). Data are also given by Pfeiffer, 1924 for Dimethylaminobenzolacetophenone and β Naphthol; Dimethylaminobenzal-*p*-methoxyacetophenone and α and β Naphthol; Benzalacetophenone-β phenylacrylophenone and α and β Naphthol.

The critical temp. of solution of the system Acetone + Diisoamylene is at — 3°.8 and the mixture contains 52.5 per cent $C_{10}H_{20}[(CH_3)_2CHCH_2CH_2]_2$. (Hartenberg, 1926.)

p ACETOTOLUIDE $CH_3CO.NHC_6H_4CH_3$.

Solubility of *p* Acetotoluide in Aqueous Solutions of Ethylalcohol (Pleuger, 1925.)

The synthetic method of Alexejeff was used. Weighed amounts of the solvent and *p* Acetotoluide were sealed in small tubes and the temperature of complete solution determined. The individual determinations were plotted and the following results read from the curves.

Wt. per cent C_2H_5OH in solvent.	Gms. $CH_3CO.NHC_6H_4CH_3$ dissolved per 100 gms. sat. solution at						
	30°.	50°.	70°.	90°.	110°.	130°.	138°.
100	10.8	20.0	35.0	54.0	72.5	88.5	94.0
89.6	11.6	22.0	37.5	57.0	75.0	90.0	....
70.6	7.5	17.0	35.0	57.5	80.0	93.0	....
50.2	3.2	8.3	21.5	50.0	81.0	94.0	....
30.1	....	2.0	5.0	22.0	51.0	55.5	....
10.0	....	....	....	2.0	5.0	13.0	....
0.0 (H_2O)	....	....	....	....	....	....	97.5

Solubility of *p* Acetotoluide in Mixtures of Ethylalcohol and Carbon Disulfide. (Pleuger, 1925.)

Wt. per cent C_2H_5OH in solvent.	Gms. $CH_3CO.NHC_6H_4CH_3$ dissolved per 100 gms. sat. solution at						
	30°.	50°.	70°.	90°.	110°.	130°.	140°.
89.8	11.8	21.5	36.5	54.7	72.3	88.3	....
70.5	14.0	23.5	37.5	55.5	72.0	87.4	....
48.9	14.5	24.5	37.5	54.0	70.5	86.7	....
30.3	12.5	21.5	34.5	51.5	68.0	85.5	94.0
10.0	5.0	11.5	23.5	41.5	61.5	82.0	92.5
0.0 (CS_2)	....	....	....	17.5	47.0	75.5	90.0

Solubility of *p* Acetotoluide in Mixtures of Ethylalcohol and Carbon Tetrachloride.

Wt. per cent C_2H_5OH in solvent.	Gms. $CH_3CO.NHC_6H_4CH_3$ dissolved per 100 gms. sat. solution at						
	30°.	50°.	70°.	90°.	110°.	130°.	140°.
80.4	10.6	14.7	34.0	52.0	71.0	87.5	94.5
60.2	10.3	19.0	32.0	49.5	67.5	85.5	93.5
40.0	9.5	17.5	29.0	45.0	63.0	82.5	92.5
20.0	6.8	13.5	23.5	38.0	57.0	78.5	91.0
0.0 (CCl_4)	....	....	....	....	33.5	69.5	87.5

ACETYLENE C_2H_2.

Solubility in Water.

The results of Winkler, 1906, Schœn, 1923, Manchot, 1924 (25°) and Gatterer, 1926, were plotted and the following values read from the smoothed curve.

t°.	Absorption coefficient *a*.	t°.	Absorption coefficient *a*.	t°.	Absorption coefficient *a*.
0.....	1.73–1.77	20.....	1.05	40.....	0.71
5.....	1.49–1.52	25.....	0.94	45.....	0.65
10.....	1.31–1.33	30.....	0.85	50.....	0.61
15.....	1.16–1.17	35.....	0.77	55.....	0.57

Absorption Coefficient a = the volume of gas (reduced to 0° and 760 mm. pressure) taken up by one volume of the liquid at the given temperature when the partial pressure of the gas equals 760 mm. mercury.

Solubility of Acetylene in Blood and in Blood Serum. (Schœn, 1923.)

In Blood.				In Blood Serum.	
t°.	Abs. coef. *a*.	t°.	Abs. coef. *a*.	t°.	Abs. coef. *a*.
9.5...	1.305	37...	0.731–0.739	10.....	1.280
10.0...	1.302	38...	0.720	10.5...	1.271
15.0...	1.136–1.140	39...	0.703	11.0...	1.244–1.256

Solubility of Acetylene in Aqueous Solutions of Prussian Blue.

(Gatterer, 1926.)

The Prussian Blue solution (Ferri ferrocyanide) was prepared by mixing 2.0 normal sodium ferrocyanide and ferric chloride, washing the resulting precipitate, redissolving in a small quantity of ferrocyanide solution and evaporating in a vacuum to a concentration of about 8 per cent. For purposes of calculation the gram equivalent of Prussian Blue was taken as $^1/_2Fe_4[Fe(CN)_6]_3 = 71.603$. The solubility of the acetylene is given in terms of the *Ostwald Solubility Expression l*, which is the volume of gas dissolved by unit volume of solvent at the temperature of the experiment.

Normality of Prussian Blue Solution.	Solubility *l* of C_2H_2 at 30°.	25°.	20°.	15°.	10°.
0.0 (= H_2O)	0.952	1.030	1.126	1.239	1.382
0.250	0.9289	1.007	1.102	1.212	1.358
0.548	0.9149	0.9937	1.088	1.199	1.339
0.750	0.9010	0.9760	1.071	1.179	1.282
1.028	0.8816	0.9527	1.044	1.145	1.282

Solubility of Acetylene in Aqueous Solutions of Ferric Hydroxide.

(Gatterer, 1926.)

In order to prepare the solvents a solution of pure ferric hydroxide in acetic acid was diluted and boiled untill the ratio of acetic acid to ferric hyroxide became 1:30-1:60. It was then evaporated under reduced pressure, whereby a much higher degree of dispersion, as shown by the Tyndall effect, was obtained. The gram equivalent of the ferric hydroxide was taken as $^1/_3Fe(OH)_3 = 35.621$.

Normality of Ferric Hydroxide solution.	Solubility *l* of C_2H_2 at 30°.	25°.	20°.	15°.	10°.
0.871	0.9400	1.018	1.111	1.227	1.364
0.521	0.9360	1.016	1.111	1.224	1.364
0.336	0.9495	1.029	1.126	1.241	1.383
0.120	0.9450	1.024	1.126	1.236	1.379

Solubility of Acetylene in Aqueous Solutions of Salts at 25°.

(Manchot, Jahrstorfer and Zepter. 1924.)

Note. — An apparatus designed to eliminate the disadvantages of the Ostwald type was used. The gas volumes were measured in a water-jacketed mercury sealed gas buret. An absorption flask, provided with a separate rec pticle for the solvent, was connected to the gas buret by glass tubing made sufficiently flexible either by a grid or by two short rubber connections. The apparatus was filled with the pure gas and this then saturated with the vapor of a small portion of the solvent. The reading was taken and the main portion of the solvent introduced and the volume of gas that it dissolved measured directly. The rubber connections of the apparatus were soaked in paraffine to render them impervious to the gas.

The authors desired to compare the amount of gas dissolved per unit weight of water in the salt solutions employed, rather than per unit volume of solution. The densities of the salt solutions were, therefore, determined. The original tables show the *absorption coefficient a* (See p. 1015) calculated not only to unit

volume of solution but also to unit weight of solution. Further calculations permitted deductions in regard to the H_2O of hydration of the salts studied.

Salt.	d_{25} of salt. sol.	Gms. anhy. salt. per 100 cc. sol.	Abs. coef. a per 100 cc. sol.	Salt.	d_{25} of salt. sol.	Gms. anhy. salt. per 100 cc. sol.	Abs. coef. a per 100 cc. sol.
None (=H_2O).	0.9971	0.00	94.1	$NaNO_3$....	1.0556	9.181	78.5
NH_4Cl.....	1.0141	5.818	82.7	»	1.1106	18.362	66.7
»	1.0294	11.631	74.7	»	1.2189	36.724	49.0
»	1.0600	23.258	64.3	$Ca(NO_3)_2$.	1.1503	22.398	64.8
KCl.....	1.0807	13.757	65.3	» ..	1.2927	44.796	44.1
»	1.1588	27.513	48.1	$Zn(NO_3)_2$..	1.1210	15.700	74.5
NaCl.....	1.0420	6.548	70.6	» ..	1.2406	31.401	59.7
»	1.0850	13.212	54.1	$Al(NO_3)_3$..	1.0822	11.846	75.5
»	1.1660	26.424	32.0	» ..	1.1502	21.771	62.9
$CaCl_2$.....	1.0806	10.593	60.6	$(NH_4)_2SO_4$.	1.0911	18.158	52.4
»	1.1675	22.665	39.1	» .	1.1501	30.464	36.3
$BaCl_2$.....	1.1085	13.135	67.5	K_2SO_4.....	1.0753	10.351	64.9
»	1.2266	27.328	49.1	Na_2SO_4....	1.0538	6.640	67.0
$MgCl_2$.....	1.0802	10.511	58.4	»	1.1111	13.730	47.6
»	1.1501	20.265	39.7	$MgSO_4$....	1.0999	10.792	54.8
$FeCl_3$.....	1.1030	13.433	63.0	»	1.1944	21.584	31.1
»	1.1638	21.558	51.6	$ZnSO_4$.....	1.1359	14.771	54.9
$AlCl_3$.....	1.0672	8.3146	62.3	»	1.2666	29.542	31.9
»	1.1150	14.349	47.1	$MnSO_4$.....	1.1283	14.747	54.8
NH_4Br.....	1.0540	10.465	84.4	»	1.2507	29.544	31.4
»	1.1100	20.931	78.8	$NiSO_4$.....	1.1096	11.42	59.9
»	1.2215	41.862	68.6	»	1.2156	22.84	38.0
KBr.....	1.0866	12.973	77.9	$CoSO_4$.....	1.1139	12.356	58.8
»	1.1750	25.947	65.5	»	1.2238	24.712	37.1
»	1.3459	51.893	47.8	$FeSO_4$.....	1.1017	10.938	61.6
NaBr.....	1.0829	11.527	72.7	»	1.2011	21.845	41.1
»	1.1668	23.054	57.9	$Al_2(SO_4)_3$..	1.1558	17.688	41.6
»	1.3307	46.108	36.1	» ..	1.2381	27.875	25.4
KNO_3.....	1.0618	10.8794	82.4	$Fe_2(SO_4)_3$..	3.2240	26.390	45.8
»	1.1232	21.7589	73.7	» ..	1.4319	52.781	22.7
$Mg(NO_3)_2$..	1.0916	14.092	74.3	$Cr_2(SO_4)_3$..	1.1657	22.356	56.7
» ..	1.1821	28.184	59.8	» ..	1.3280	44.712	32.4

Freezing-point lowering data (see foot-note, p. 1001) are given for mixtures of Acetylene and Hydrobromic acid by Maass and Russell, 1918.

ACONITINE $C_{34}H_{45}NO_{11}$.

Solubility of Aconitine in Water at 15°.

(Kolthoff, 1925.)

The author first determined the dissociation constant of aconitine. For this purpose the p_H values were estimated colorimetrically for a 0.01 molecular solution of aconitine chloride to which increasing amounts of 0.01 normal Na OH were added. From this series of determinations the dissociation constant K, for aconitine was found to be $1.3.10^{-6}$.

The solubility product was next estimated by adding 0.1 cc. of 0.01 normal NaOH to 5.0 cc. of 0.01 molecular aconitine chloride solution, and after seeding, allowing to stand 24 hours. Only a very slight precipitation occurred and it was concluded that the aconitine was in equilibrium with a solution which was 8.10^{-3} normal with respect to aconitine chloride and had a hydroxyl ion concentration of $6.4.10^{-8}$ These values correspond to a solubility product of 5.10^{-10}. The solubility is, therefore, $5.10^{-10} \div 1.3.10^{-6} = 4.10^{-4}$ or 260 milligrams aconitine per liter.

The author also states that he found a saturated solution of *Aconitine Nitrate* in water to have a concentration of $2.6.10^{-4}$ mol. per liter at 15°.

ACRIDINE $C_6H_4\langle{}^{CH}_{N}\rangle C_6H_4$.

Freezing-point lowering data (see foot-note, p. 1001) are given for mixtures of Acridine and each of the following compounds :

Anthracene (Pascal, 1921.)
Methyl acridine »
Carbazole »
Nitrosodimethylaniline (Kremann and Ulk, 1919.)
Hydroquinol (Kremann and Slovak, 1920.)
α and β Naphthol (Kremann and Slovak, 1920.)
Phenanthrene (Pascal, 1921.)
Phenol (Kremann and Slovak, 1920.)
Pyrocatechol »
Resorcinol »

Results for mixtures of 5.phenylacridine and picric acid are given by Bassett and Simmons, 1921.

ACROLEIN $CH_2 : CH.CHO$.

Reciprocal Solubility of Acrolein and Water.
(Boutaric, 1920: Boutaric and Corbet, 1926.)

The temperatures of clouding and of clearing in mixtures of weighed amounts of acrolein and water were determined. Sealed tubes were used at the higher temperatures. The acrolein was stabilized by the addition of $\frac{1}{250}$ th of its weight of hydroquinol. The original determinations were plotted and the following results read from the curve. The authors also give a few results for the effect of different amounts of hydroquinol and of gallic acid upon the reciprocal solubilities. They found by extrapolation of the critical temperatures of acrolein stabilized with different amounts of hydroquinol, that the critical temperature of pure acrolein in water is 88°.2. Determinations are also given of the effect upon the critical temperature resulting from the presence of increasing amounts of soluble resin of acrolein.

	Gms. $CH_2 : CH.CHO$ per 100 gms.			Gms. $CH_2 : CH.CHO$ per 100 gms.	
t°.	H_2O rich layer (lower).	Acrolein rich layer (upper).	t°.	H_2O rich layer (lower).	Acrolein rich layer (upper).
—10.....	20.0	96.0	50.....	25.0	87.5
0.....	20.0	95.5	60.....	29.0	84.5
+10.....	20.5	94.5	70.....	34.0	80.0
20.....	21.0	93.2	80.....	41.5	73.0
30.....	21.5	92.0	85.....	48.0	67.0
40.....	22.5	90.0	88 crit. t.	56.2	

r β Methyl**ADIPIC ACID** $COOH.(CH_2)_3.CH.CH_3.COOH$.

100 gms. H_2O dissolve 4.47 gms. *r* β $COOH.(CH_2)_3.CHCH_3.CO\,OH$ at 0°, and 14.43 gms. at 20°. (Meurisse.)

ALANINE (α Aminopropionic Acid) $CH_3CH(NH_2)COOH$.

Phenyl **ALANINE** (β Phenyl α Aminopropionic Acid) $C_6C_5.CH_2.CH(NH_2)COOH$.

SOLUBILITY OF *d. l.* ALANINE AND OF *d. l.* PHENYLALANINE IN WATER AND IN AQUEOUS SALT SOLUTIONS AT 21°. (Pfeiffer and Angern, 1924.)

The saturated solutions in water were prepared by continuous agitation at constant temperature for 3 days. The filtered solution was analyzed by the Sörensen method of titration, in which formaldehyde is added and the resulting methylene aminoacid titrated with sodium hydroxide, using phenolphthalein as indicator. The solubility in salt solutions was determined by adding the amount of salt to 5.0 cc. of the saturated solution in water necessary to yield 0.02 molecular concentration, and continuing the agitation for another 3 days. The resulting precipitate of amino acid was filtered, dried at 120-130° and its weight (after correction for inorganic salts by ashing) subtracted from the aminoacid originally present in the water.

Results for Alanine.

Solvent.	Gms. Alanine per 100 cc. sat. sol.
Water	13.87
Aq. 0.02 molecular CH_3COOK.	12.12
» $(NH_4)_2SO_4$.	11.08

Results for Phenylalanine

Solvent.	Gms. Phenylalanine per 100 cc. sat. sol.
Water	1.49
Aq. 0.02 molecular CH_3COOK.	1.24
» NaCl	1.20
» $(NH_4)_2SO_4$.	0.59

ALIZARIN (1.2 Dioxyanthraquinone) $C_{14}H_6O_2(OH)_2$.

100 gms. chloroform dissolve 0.12 gm. alizarin at 20° (Pawlewski, 1914, 1926.)
» carbon tetrachloride » 0.01 » »

Ethyl, Methyl, etc. **ALLOPHANATES** $NH_2.CO.NH.COOC_2H_5$.

SOLUBILITIES IN ETHYLALCOHOL AND IN ETHER. (Béhal, 1919.)

As a method of isolation and identification, an extensive series of alcohols were converted into the corresponding allophanates by the action upon them of cyanic acid. This gas was prepared by the depolymerization of cyanuric acid at about 300° in a very slow current of CO_2, and when passed into the cooled alcohol gave rise to the general reaction, $2\ O.C.NH + C_2H_5OH = NH_2.CO.NH.COOC_2H_5$, which proceeded rapidly with evolution of heat and brisk solidification of the mixture. In each case the product, after cooling, was washed with ether, to remove unchanged alcohol and urethan, which is simultaneously formed in greater or less amount. The allophanates were then each purified by dissolving in warm alcohol, benzene or acetone and crystallizing by cooling. They were all crystalline and only slightly soluble in alcohol and ether. The author does not describe the procedure followed in determining the solubilities which he reports. In a private communication he states that « 10 cc. of each of the saturated solutions were evaporated to dryness and the residue weighed after standing in a desiccator containing sulfuric acid ». The figures in parentheses show the melting-points of the allophanates.

Allophanate of : (Primary alcohols).	t°.	Gms. Allophanate per 10 cc. of Alcohol.	Gms. Allophanate per 10 cc. of Ether.
Ethyl (190°)	20	0.455	0.080
Methyl (212°)	17	0.140	0.030
Propyl (175°.5)	17	0.750	0.139
n Butyl (150°)	18	1.230	0.246
Iso Butyl (180°.5)	15	0.947	0.302
Iso Amyl (150°)	13	1.411*	0.698
Hexyl (165°)	17	0.480*	0.120
Iso Hexyl (190°)	14	0.471*	0.220*
Heptyl (160°)	17	0.350*	0.120
Octyl (157°)	17	0.220*	0.140
Nonyl (158°)	17–13	0.120*	0.091
Decyl (159°)	17	0.054*	0.058
Undecyl (155°)	13	0.105*	0.117
Dodecyl (159°.5)	17	0.015*	0.025
Allyl (165°)	18	0.855	0.212
Undecylenyl (143°)	17	0.642	0.181

* Absolute alcohol or ether was used in these cases.

SOLUBILITIES OF ALLOPHANATES IN ETHYLALCOHOL AND IN ETHER (*Con.*).

Allophanates of Secondary and Tertiary alcohols.		t°.	Gms. Allophanate per 10 cc. of Alcohol.	Ether.
Propanol.2	(180)...	16	0.815*	0.521*
Me Et Carbinol	(159.5).	18	0.748	0.571
Me Pr »	(154)...	18	0.535	0.531
Di Et »	(179.5).	18	0.996	0.457
Me Bu »	(173)...	17	0.970	0.300
Et iso Pr »	(179)...	19	1.361*	0.485
Me iso Bu »	(161)...	16.5	0.288	0.198
Di Pr »	(206)...	16.5	0.410	0.191
Octyl »	(155)...	14	0.204*	0.069
Di iso Bu »	(156)...	16.5	1.158	1.064
Tri Me »	(190)...	15	0.723*	0.290
Amyl »	(152)...	16	1.125*	0.289
Hexyl (1)	(128)...	16	2.400*	0.965
Heptyl (2)	(132)...	14	0.920*	0.446
Octyl (3)	(149)...	16	1.144*	0.531
Nonyl (4)	(145)...	16	1.340*	0.891*
Di Me (5)	(113.5).	14	0.642*	0.793*

* In absolute alcohol or ether.

Allophanates of Aryl alcohols, Cyclic alcohols, and Phenols.		t°.	Gms. Allophanate per 10 cc. of Alcohol.	Ether.
Benzyl	(121)...	17	0.220	0.050
Phenylethyl	(186)...	17	0.080	0.033
» propyl	(165)...	16.5	0.157	0.089
Me Saligenine	(180)...	17	0.106	0.064
Anisyl	(180.2).	17	0.070	0.016
Et Vanillyl	(173)...	17	0.039	0.014
Piperonyl	(176.5).	16.5	0.066	0.023
Phenyl ethyl (Sec.)	(181.5).	19	0.680	0.016
Cyclo (6)	(148)...	17	0.238	0.070
Cinnamyl	(185)...	17	0.810	0.050
Cyclo pentanyl	(179.5).	17	0.978	0.322
» hexanyl	(179)...	20	0.834	0.247
Menthyl	(213)...	18	0.140	0.067
Carvon (7)	(192.3).	17	0.228	0.026
Menthyl (tery)	(187)...	17	0.180	0.070
Iso pulegyl	(219)...	17	0.263	0.222
Phenyl	(180)...	19	0.381	0.036
o cresyl	(185)...	18	0.474	0.063
p »	(194)...	18	0.279	0.092

(1) Methyl-2-pentanol-5; (2) Dimethyl-2.4-Pentanol-2; (3) Ethyl-3-Hexanol-3; (4) Methyl-2-Ethyl-4-Hexanol-4; (5) Dimethylnonylcarbinol; (6) Cyclohexylbutanyl; (7) Carvon menthyl.

ALLOXANTIN $C_6H_6O_8N_4.2H_2O$.

SOLUBILITY IN WATER AND IN AQUEOUS SOLUTIONS OF ALLOXAN AT 25°.
(Biillmann and Bentzon, 1918.)

Oxygen was excluded during the determinations by the use of CO_2. Aqueous solutions rotated from 3.8 to 5.5 hours gave practically identical results. The solutions were analyzed by estimations of total nitrogen and alloxantin nitrogen determined colorimetrically. The solubility of alloxantin in water at 25° was found to be 0.2885 gms. $C_6H_6O_8N_4.2H_2O$ per 100 gms. sat. solution. The solubility in aqueous solutions of alloxan was as follows.

Grams per 100 grams sat. solution.		Gm. mols. $\times 10^{-4}$ per 100 gms. sat. sol.	
Alloxan nitrogen.	Alloxantin nitrogen.	Alloxan.	Alloxantin.
0.0023	0.0487	0.82	8.69
0.0032	0.0475	1.14	8.49
0.0045	0.0458	1.61	8.19
0.0054	0.0455	1.93	8.12
0.0112	0.0412	4.00	7.35
0.0197	0.0363	7.03	6.50
0.0258	0.0335	9.20	5.98
0.0409	0.0278	14.6	4.98
0.0773	0.0219	27.6	3.91
0.0827	0.0204	29.5	3.64
0.0869	0.0200	31.0	3.59
0.1140	0.0177	40.7	3.18
0.1606	0.0151	57.3	2.68

ALLYLAMINE $CH_2 : CH.CH_2.NH_2$.

DISTRIBUTION BETWEEN WATER AND XYLENE AT 25°. (Smith, 1921-1922.)

Gm. mols. Allylamine per liter H_2O layer.....	1.85	3.30	6.50
» » Xylene layer.....	0.35	0.55	1.30

ALLYLENE $CH_3.CH : CH$.

Freezing-point lowering data are given for mixture of $CH_3.CH : CH + HBr$ by Maas and Russel, 1921

ALUMINIUM BROMIDE $AlBr_3$.

100 gms. Pyridine dissolve 8.14 gms. $AlBr_3$ at 25° (Müller, R., 1924.)

Reciprocal solubilities determined by the method of lowering of the freezing-point (see foot-note, p. 1001) are given by Isbekow, 1925, for mixtures of **Aluminium Bromide** and each of the following compounds : $AlCl_3$, $AsBr_3$, CBr_4, $SbBr_3$, $BiBr_3$ and $HgBr_2$. Similar data are given by Kendall, Crittenden and Miller, 1923, for mixtures of **Aluminium Bromide** and each of the following compounds : $AsBr_3$ CBr_4, $SbBr_3$, $HgBr_2$, HgBr, LiBr, NaBr, KBr, NH_4Br, AgBr, $CaBr_2$, $BaBr_2$, $MgBr_2$, $ZnBr_2$, $CaBr_2$, TlBr, $SnBr_2$, $SnBr_4$, $PbBr_2$, PBr_3 and $MnBr_2$.

ALUMINIUM CHLORIDE $AlCl_3$.

Reciprocal solubilities determined by the method of lowering of the freezing-point (see foot-note, p. 1001) are given by Kendall, Crittenden and Miller, 1923 for mixtures of **Aluminium Chloride** and each of the following compounds : LiCl, NaCl, KCl, NH_4Cl, CuCl, AgCl, $BaCl_2$, $MgCl_2$, HgCl, $HgCl_2$, TlCl, $SnCl_2$, $SnCl_4$, $SbCl_3$ and $MnCl_2$.

ALUMINIUM FLUORIDE AlF_3.

Freezing-point lowering data (see foot-note, p. 1001) are given by Fedotieff and Iljinsky, 1923 for $AlF_3 + CaF_2$, $AlF_3 + NaF$ and $AlF_3 + CaF_2 + NaF$.

ALUMINIUM HELIANTHATE $(C_{14}H_{14}N_3SO_3)_3Al.6H_2O$.

100 cc. H_2O dissolve 0.0092 gms. $(C_{14}H_{14}N_3SO_3)_3Al.6H_2O$ at 20°-25°.
(Stark and Dehn, 1918.)

ALUMINIUM HYDROXIDE $Al(OH)_3$.

Solubility in Water at 18°. (Remy and Kuhlmann, 1924; Remy, 1925.)

The determinations were made by (1), the ordinary electrolytic conductivity method taking into consideration the carbonate content of the water and assuming that the aluminium was present as completely dissociated hydroxide and (2) by a conducto-titrometric method.

By method (1) there was found 0.00104 gms. or 0.010 millimols. Al_2O_3 per liter.
» (2) » 0.00094 » 0.009 »

Solubility of Aluminium Hydroxide in Aqueous Solutions of Ammonium Hydroxide at 20°. (Archibald and Habasian, 1917.)

The freshly prepared $Al(OH)_3$ suspended in aqueous NH_4OH solutions was rotated in sealed tubes at constant temperature untill attainment of equilibrium. The solutions were filtered and 10 cc. portions evaporated and residues weighed in platinum crucibles.

Normality of NH_4OH solution.	Gms. $Al(OH)_3$ dissolved per 100 cc. sat. sol.	Normality of NH_4OH solution.	Gms. $Al(OH)_3$ dissolved per 100 cc. sat. sol.
0.05	0.0070	0.200	0.038
0.10	0.0080	0.500	0.045
0.125	0.025	1.000	0.024

Solubility of Aluminium Hydroxide in Aqueous Solutions of Ammonium Hydroxide containing Ammonium Nitrate and Potassium Nitrate.
(Archibald and Habasian, 1917.)

t°.	Normality of NH_4OH.	Wt. % added NH_4NO_3.	Gms. $Al(OH)_3$ per 100 cc. sat. sol.	t°.	Normality of NH_4OH.	Wt. % added KNO_3.	Gms. $Al(OH)_3$ per 100 cc. sat. sol.
20...	1.0	5.0	0.0190	20....	1.0	5.0	0.0760
20...	1.0	10.0	0.0085	20....	1.0	10.0	0.1310
20...	1.0	30.0	0.0036	30....	1.0	5.0	0.1120
20...	0.5	5.0	0.0145	30....	1.0	10.0	0.1320
20...	0.5	10.0	0.0011	20....	0.5	5.0	0.0450
30...	1.0	5.0	0.0143	20....	0.5	10.0	0.0485
30...	1.0	10.0	0.0066	30....	0.5	5.0	0.0713
30...	0.5	5.0	0.0081	20....	0.5	10.0	0.1033
30...	0.5	10.0	0.0010				

EQUILIBRIUM IN THE SYSTEM ALUMINIUM OXIDE, BARIUM OXIDE AND WATER AT 20°.
(Malquori, 1926.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
BaO.	Al_2O_3.	Solid Phase.	BaO.	Al_2O_3.	Solid Phase.
0.0100	0.0020	$Al_2O_3.XH_2O$	1.873	0.456	$Al_2O_3.BaO.6H_2O$
0.5187	0.0373	»	2.134	0.630	» $+Al_2O_3.2BaO.5H_2O$
0.9016	0.1179	»	2.211	0.641	$Al_2O_3.2BaO.5H_2O$
1.205	0.2105	» $+Al_2O_3.BaO.6H_2O$	3.511	0.671	» $+Ba(OH)_2.8H_2O$
1.330	0.279	$Al_2O_3.BaO.6H_2O$	3.450	0.430	$Ba(OH_2).8H_2O$
1.654	0.345	»	3.390	0.002	»
1.732	0.378	»	3.320	0.001	»

Freezing-point Diagrams are given for $Al_2O_3 + MgO$, for $Al_2O_3 + MgO + CaO$, and for $MgO + CaO$ by Rankin and Merwin, 1916. Similar data for $Al_2O_3 + MgO + SiO_2$ and, $Al_2O_3 + CaO + MgO$ are given by Meissner, 1919.

ALUMINIUM IODIDE AlI_3.

100 gms. Pyridine dissolve 0.82 gms. AlI_3 at 25° (Müller, R., 1924.)

ALUMINIUM NITRATE $Al_2(NO_3)_6.18H_2O$.

SOLUBILITY OF ALUMINIUM NITRATE IN AQUEOUS SOLUTIONS OF NITRIC ACID AT 25°.
(Inamura, 1919.)

An excess of carefully purified $Al_2(NO_3)_6.18H_2O$ was suspended in aqueous nitric acid solutions and rotated in a thermostat for one or two days. The saturated solution and undissolved solid were separated by filtration through asbestos and both analyzed. For the concentrated nitric acid solutions dehydrated aluminium nitrate was used. The results when plotted yield a curve with two branches instead of three as interpreted by the author. The results for regular intervals of concentration of nitric acid are as follows :

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
HNO_3.	$Al_2(NO_3)_6$.	Solid Phase.	HNO_3.	$Al_2(NO_3)_6$.	Solid Phase.
0.0	39.0	$Al_2(NO_3)_6.18H_2O$	65.1	1.1	$Al_2(NO_3)_6.18H_2O$
10.0	30.5	»	68.5	1.0	»
20.0	22.6	»	72.5	1.2	» $+Al_2(NO_3)_6.16H_2O$
30.0	15.5	»	75.0	0.6	$Al_2(NO_3)_6.16H_2O$
40.0	9.0	»	80.0	0.2	»
50.0	3.9	»	85.0	0.1	»
60.0	1.6	»	90.0	0.35	»

SOLUBILITY OF ALUMINIUM NITRATE IN AQUEOUS SOLUTIONS OF NITRIC ACID AT DIFFERENT TEMPERATURES. (Milligan, 1922.)

Rapid stirring of an excess of the crystals with the acid for a first period of 30 minutes followed by a second period of a « few minutes » was employed. The results, when plotted yield curves from which the following figures for regular intervals of concentration of nitric acid were read. The figures in parentheses are the approximate densities of the saturated solutions at 20°.

Gms. HNO_3 per 100 gms. sat. sol.	Gms. $Al(NO_3)_3$ per 100 gms. sat. solution at :			
	0°.45.	20°.	40°.	60°.
0	36.0 (1.324)	40.0 (1.383)	44.0 (1.430)	47.5 (1.461)
10	27.0 (1.314)	31.0 (1.368)	36.0 (1.402)	40.5 (1.457)
20	19.5 (1.311)	23.0 (1.354)	29.0 (1.386)	34.5 (1.457)
30	13.5 (1.315)	16.0 (1.345)	21.0 (1.377)	29.0 (1.460)
40	6.0 (1.320)	9.0 (1.340)	15.0 (1.370)	24.0 (1.468)
50	1.5 (1.336)	4.0 (1.345)	9.5 (1.375)	20.0 (1.480)
60	0.2 (1.363)	1.5 (1.364)	5.5 (1.392)	—
70	0.25(1.432)	0.75(1.405)	3.0 (1.430)	

ALUMINIUM SULFATE $Al_2(SO_4)_3.18H_2O$.

Solubility of Aluminium Sulfate in Aqueous Solutions of Copper Sulfate at 25° and at 30° and Vice Versa.

Results at 25°. (Occlesshaw, 1925.)			Results at 30°. (Caven and Mitchell, 1925.)		
Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$CuSO_4$.	$Al_2(SO_4)_3$.	Solid Phase.	$CuSO_4$.	$Al_2(SO_4)_3$.	Solid Phase.
0.0	27.80	$Al_2(SO_4)_3.18H_2O$	0.00	28.86	$Al_2(SO_4)_3.18H_2O$
2.50	26.60	»	3.39	26.83	»
3.83	25.64	»	5.74	25.22	»
5.18	24.86	» + $CuSO_4.5H_2O$	6.30	24.64	$CuSO_4.5H_2O$
5.32	24.65	$CuSO_4.5H_2O$	7.67	22.00	»
6.11	23.18	»	9.79	17.65	»
8.18	18.83	»	12.13	13.80	»
11.33	13.05	»	16.70	5.97	»
14.69	7.50	»	18.65	2.75	»
16.59	3.79	»	20.33	0.00	»
18.49	0.00	»			

Solubility of Aluminium Sulfate in Aqueous Solutions of Ferrous Sulfate at 25° and Vice Versa. (Occlesshaw, 1925.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$FeSO_4$.	$Al_2(SO_4)_3$.	Solid Phase.	$FeSO_4$.	$Al_2(SO_4)_3$.	Solid Phase.
2.11	26.75	$Al_2(SO_4)_3.18H_2O$	9.36	20.80	$Al_2(SO_4)_3.FeSO_4.24H_2O$
3.85	25.64	»	10.17	20.16	»+$FeSO_4.7H_2O$
4.13	25.41	»+$Al_2(SO_4)_3.FeSO_4.24H_2O$	10.60	19.37	$FeSO_4.7H_2O$
4.19	25.21	$Al_2(SO_4)_3.FeSO_4.24H_2O$	15.05	12.29	»
5.57	23.90	»	15.57	11.51	»
6.60	23.20	»	18.68	6.98	»
7.12	22.64	»	19.14	6.06	»
8.06	21.62	»	22.98	0.00	»

Solubility of Aluminium Sulfate in Aqueous Solutions of Manganese Sulfate at 30° and Vice Versa. (Caven and Mitchell, 1925.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$MnSO_4$.	$Al_2(SO_4)_3$.	Solid Phase.	$MnSO_4$.	$Al_2(SO_4)_3$.	Solid Phase.
0.00	28.86	$Al_2(SO_4)_3.18H_2O$	19.91	15.01	$Al_2(SO_4)_3.MnSO_4.22H_2O$
7.41	24.42	»	27.39	10.40	»
11.09	21.93	»	31.43	8.43	»
12.14	21.13	»	32.97	7.21	»+$MnSO_4.3H_2O$
15.23	19.59	» +$Al_2(SO_4)_3.MnSO_4.22H_2O$	37.94	2.47	$MnSO_4.5H_2O$
15.96	18.11	$Al_2(SO_4)_3.MnSO_4.22H_2O$	40.03	0.00	»

Solubility of Aluminium Sulfate in Aqueous Solutions of Nickel Sulfate at 30° and Vice Versa. (Caven and Mitchell, 1925 *a*.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$NiSO_4$.	$Al_2(SO_4)_3$.	Solid Phase.	$NiSO_4$.	$Al_2(SO_4)_3$.	Solid Phase.
0.00	28.86	$Al_2(SO_4)_3.18H_2O$	17.53	15.29	$NiSO_4.7H_2O$
4.74	25.87	»	22.56	8.70	»
10.87	21.95	»	23.58	7.34	»
12.91	21.30	» + $NiSO_4.7H_2O$	26.03	5.29	»
13.29	20.79	$NiSO_4.7H_2O$	30.77	0.00	»

Solubility of Aluminium Sulfate in Aqueous Solutions of Potassium Sulfate at 25° and Vice Versa. (Britton, 1922.)

The original determinations are given in terms of grams of water required to dissolve 100 grams of solute and percentage of K_2SO_4 in s lute. These values have been recalculated to unit weight of saturated solution with results as follows.

Gms. per 100 gms. sat. sol.		Solid Phase.	Gms. per 100 gms. sat. sol.		Solid Phase.
K_2SO_4.	$Al_2(SO_4)_3$.		K_2SO_4.	$Al_2(SO_4)_3$.	
0.00	27.70	$Al_2(SO_4)_3.18H_2O$	2.05	4.74	$K_2Al_2(SO_4)_2.24H_2O$
0.98	23.02	»	2.27	4.47	»
1.93	30.27	»+$K_2Al_2(SO_4)_2.24H_2O$	2.99	3.58	»
1.94	27.86	$K_2Al_2(SO_4)_2.24H_2O$	3.61	2.99	»
1.46	15.98	»	5.73	2.03	»
1.45	11.28	»	7.25	1.85	»
1.50	10.22	»	10.60	1.45	»
1.72	8.43	»	11.47	1.35	»+K_2SO_4
1.78	7.07	»	10.69	0.76	K_2SO_4
1.87	6.13	»	10.75	0.00	»

Solubility of Aluminium Sulfate in Aqueous Solutions of Silver Sulfate at 30° and Vice Versa. (Caven and Mitchell, 1925 *a*.)

Mols. per 1000 gms. H_2O.		Solid Phase.	Mols. per 1000 gms. H_2O.		Solid Phase.
Ag_2SO_4.	$Al_2(SO_4)_3$.		Ag_2SO_4.	$Al_2(SO_4)_3$.	
0.00	1.187	$Al_2(SO_4)_3.18H_2O$	0.03o6	0.03026	Ag_2SO_4
0.0314	1.276	» +Ag_2SO_4	0.0304	0.1449	»
0.0310	0.9210	Ag_2SO_4	0.0292	0.0777	»
0.0308	0.8153	»	0.0285	0.000	»
0.0306	0.5114	»			

ALUMINIUM Nitrosophenylhydroxylamine.

100 gms. H_2O dissolve $3.3.10^{-5}$ gms. aluminium nitrophenylhydroxylamine at 18°. (Martin.)

AMMONIA NH_3.

Solubility of Ammonia in Water. (Neuhausen and Patrick, 1921.)

The authors developed a static method for measuring the partial pressure of water and of ammonia over aqueous ammonia solutions. The apparatus consists of two recepticles connected respectively to each arm of a delicate manometer, in such a fashion that very small differences in pressure between the two can be very accurately measured. Into these two recepticles ammonia vapor at a certain pressure is introduced. Then into one, water vapor is successively added in small portions. The total pressure in this recepticle gradually increases untill the partial pressure of the water vapor equals that corresponding to the partial pressure of water vapor over a solution, whose partial pressure of ammonia at that temperature is such as at the start. Any further addition of water vapor will entail condensation of water with consequent solution of some of the ammonia and reduction in the total pressure. When, therefore, the total pressure in the recepticle to which water vapor is added reaches a maximum, and just begins to diminish, this point shows the partial pressure of water vapor corresponding to that of the ammonia at the temperature in question. A series of such determinations were made at 0°, 20°

and 40°. A curve was plotted for each temperature taking the measured partial pressures of water as the ordinates and the total pressure of ammonia plus water as absissae. From these curves the following results, showing the partial pressure of water corresponding to regular intervals of total pressure above the aqueous solution of ammonia, were read.

Total pressure of $H_2O + NH_3$ in mm.	Partial pressure of H_2O in mm. at 0°.	20°.	40°.	Total pressure of $H_2O + NH_3$ in mm.	Partial pressure of H_2O in mm. at 20°.	40°.
1000	1.06	8.8	34.2	2600	4.8	18.8
1200	0 92	8.2	31.7	2800	4.5	18.5
1400	0.78	7.6	29.2	3000	4.2	18.2
1600	0.65	7.0	26.5	3200	4.0	18.1
1800	0.53	6.6	24.0	3400	3.7	17.9
2000	0.41	6.1	22.0	3600	3.5	17.4
2200	0.29	5.7	20.5	3800	3.3	17.6
2400	0.19	5.2	19.5	4000	3.1	17.5

The determinations of the *Solubility of ammonia in water* were made by repeatedly introducing ammonia into a recepticle containing a given volume of water, untill no further diminution in pressure occurred after thorough shaking. By means of a special device a portion of the saturated solution was withdrawn without a material change in pressure, and thus without alteration in the content of ammonia. Successive samples were titrated and the following results were calculated from these titrations and the pressure readings.

t°.	Mole fraction per cent ammonia.	Partial pressure in mm. of Ammonia.	Water.	Density of solution.	Per cent contraction in volume.
0.....	51.676	915	1.25	0.842	7.50
0.....	52.382	944	1.19	0.842	7.80
0.....	54.735	1140	0.97	0.833	7.80
0.....	61 206	1409	0.77	0.817	9.21
0.....	62.765	1499	0.708	0.812	8.52
0.....	65.076	1684	0.61	0.803	8.51
0.....	65.711	1732	0.545	0.800	8.35
0.....	66.621	1865	0.46	0.795	8.12
20.....	34.886	728	9.4	0.882	7.07
20.....	36.508	798	9.25	0.878	7.25
20.....	42.077	1140	8.6	0.864	8.30
20.....	42.392	1165	8.55	0.862	8.17
20.....	43.086	1226	8.4	0.854	8.16
20.....	43.731	1281	8.3	0.848	7.37
20.....	48.175	1677	7.05	0.845	8.96
20.....	49.941	1938	6.33	0.835	8.36
20.....	53.940	2655	5.1	0.825	9.47
20.....	55.970	3076	4.45	0.817	9.47
20.....	56.923	3277	4.15	0.815	9.65
40.....	25.011	752	36.5	0.902	6.05
40.....	25.366	774	36.2	0.9005	6.21
40.....	30.690	1134	32.1	0.8833	7.21
40.....	32.686	1335	29.5	0.817	7.68
40.....	33.134	1376	29.0	0.8755	7.74
40.....	36.326	1787	23.9	0.864	8.22
40.....	39.026	2180	20.5	0.856	8.52
40.....	41.133	2460	19.0	0.849	9.05
40.....	42.925	2832	18.42	0.843	10.00
40.....	44.624	3226	18.0	0.837	9.49
40.....	44.557	3214	18.0	0.837	9.42
40.....	46.335	3640	17.6	0.828	9.40

Solubility in Water Determined by the Method of Lowering of the Freezing-Point. (Postma, 1920; Elliott, 1924.)

The closely agreeing determinations of these investigators were plotted on cross-section paper and the following results read from the curve.

t°.	Mole per cent NH_3.	Gms. NH_3 per 100 gms. solution.	Solid Phase.	t°.	Mole per cent NH_3.	Gms. NH_3 per 100 gms. solution.	Solid Phase.
0.0.....	0.0	0.0	Ice	−88.3 Eutec.	57.5	56.11	$NH_3.H_2O+2NH_3H_2O$
− 10.0.....	9.2	8.75	»	−87.5.....	58.0	56.63	$2NH_3.H_2O$
− 20.0.....	15.2	14.49	»	−85.....	59.2	57.84	»
− 40.0.....	22.2	21.22	»	−82.5.....	60.5	59.16	»
− 60.0.....	27.0	25.9	»	−80.....	63.0	61.69	»
− 80.0.....	31.0	29.8	»	−78.2 m. pt..	66.5	65.28	»
− 90.0.....	33.0	31.76	»	−80.....	70.5	60.36	»
−100.0 Eutec.	34.5	33.23	»+NH_3H_2O	−85.....	76.0	75.00	»
− 95.0.....	37.2	35.88	NH_3H_2O	−87.5.....	78.0	77.05	»
− 90.0.....	40.0	38.6	»	−90.0.....	79.7	78.83	»
− 85.0.....	43.0	41.61	»	−92.5 Eutec.	81.5	80.05	»+NH_3
− 80.0.....	46.5	45.1	»	−90.....	83.6	82.87	NH_3
− 79 m. pt..	49.5	48.08	»	−87.5.....	86.0	85.55	»
− 80.....	52.2	50.81	»	−85.....	88.5	87.92	»
− 82.5.....	54.6	53.20	»	−82.5.....	92.0	91.56	»
− 85.0.....	56.0	54.62	»	−80.0.....	95.7	95.45	»
− 87.5.....	57.2	55.82	»	−77.7.....	100.0	100.00	»

Vapor Pressure of Aqueous Ammonia Solutions. (Sherwood, 1925.)

This author collected the available data on the partial vapor pressure of ammonia in water and plotted the results on logarithmic paper to reduce the curvature and obtain constant percentage errors. The results of Raoult, Carius, Perman, Watts, Sims, Roscoe and Ditmar, Cragoe, Myers and Taylor, Mallet, Mollier, Smits and Postma, Doryer and Gaus were used.

Gms. NH_3 per 1000 gms. H_2O.	Partial Pressure of NH_3 in mm. Hg at						
	0°.	10°.	20°.	30°.	40°.	50°.	60°.
1000	947	.....	.....	.....	.....	.....	.....
900	785	.....	.....	.....	.....	.....	.....
800	636	987	.....	.....	.....	.....	.....
700	500	780	.....	.....	.....	.....	.....
600	380	600	945	.....	.....	.....	.....
500	275	439	686	.....	.....	.....	.....
400	190	301	470	719	.....	.....	.....
300	119	190	298	454	692	.....	.....
250	89.5	144	227	352	534	825	.....
200	64	103.5	166	260	395	596	834
150	42.7	70 1	114	179	273	405	583
100	25.1	41.8	69.6	110	167	247	361
75	17 7	29.9	50.0	79.7	120	179	261
50	11.2	19.1	31.7	51	76.5	115	165
40	.....	16.1	24.9	40.1	60.8	91.1	129.2
30	.....	11.3	18.2	29 6	45	67.1	94.3
25	.....	.....	15	24.4	37.6	55.7	77
20	.....	.....	12	19.3	30	44.5	61
16	.....	.....	.....	15.3	24.1	35.5	48.7
12	.....	.....	.....	11.5	18.3	26.7	36.3
10	.....	.....	.....	.....	15.4	22.2	30.2

THE SYSTEM AMMONIA, CARBON DIOXIDE AND WATER. (Terres and Weiser, 1921.)

The saturated solutions were prepared by mixing various amounts of ammonium bicarbonate, carbonate or carbamate with water or aqueous solutions of ammonia and rotating at constant temperature for many days or weeks. The original tables show the composition of the mixtures used to obtain saturation with respect to one or the other of the several solid phases. In the following tables (1) designates ammonium bicarbonate, $NH_4 H CO_3$, (2) ammonium carbonate $(NH_4)_2 CO_3 H_2 O$, (3) ammonium carbamate $NH_2CO_2NH_4$, (1.2) designates the double salt $2 NH_4HCO_3 . (NH_4)_2 CO_3 H_2 O$, (1.3) the double satl, $NH_4 H CO_3 . NH_2 CO_2 NH_4$.

Results at 0°.1.			Results at 20°.			Results at 40°.		
Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
NH_3.	CO_2.	Solid Phase.	NH_3.	CO_2.	Solid Phase.	NH_3.	CO_2.	Solid Phase.
2.6	6.05	(1)	3.95	9.25	(1)	6.18	14.05	(1)
8.8	12.1*	»	4.8	9.77*	»	7.2	14.9	»
10.6	14.0	»	9.3	13.9	»	10.2	17.0*	—
11.2	14.8*	(1)+(1.2)	9.4	15.1*	»	13.8	20.1*	—
14.2	17.8*	(1.2)	14.2	18.8	—	14.6	21.5	(1)
14.3	18.1*	»	16.0	20.4	»	17.3	24.4*	»
14.4	18.2	»	17.3	21.8	(1)+(1.2)	17.7	24.8	»
15.1	17.6	(2)	17.3	22.0	»	19.6	27.0*	—
15.0	18.0	»	18.5	23.2	(1.2)	20.3	28.1*	(1)
15.2	17.4*	»	19.5	24.3	»	21.0	28.2	(1)+(1.3)
15.8	17.1*	»	19.6	24.4	»	21.0	28.4	»
16.5	15.8*	»	20.0	24.8*	»	22.3	28.9*	(1.3)
17.5	13.2	»	20.1	24.8*	(2)+(1.2)	23.3	29.4	»
23.7	13.3*	»	20.3	25.0*	»	24.0	29.8*	»
25.4	13.3*	»	20.2	24.9	»	25.25	30.5	—
25.6	12.8	»	20.6	24.8	(2)	26.5	31.1	(1.3)
26.5	14.9*	»	22.0	24.8	»	27.8	31.8	»
26.5	12.7*	(?)	25.8	24.4*	»	28.1	32.3*	»
28.7	12.0	(2)	26.6	24.4	»	28.6	32.4	»
33.2	13.6	(2)+(3)	28.6	24.0	»	29.1	32.6	»
35.6	12.3*	(?)	27.8	24.0	»	29.8	32.7	(1.3)+(3)
38.9	11.5*	(3)	29.8	24.2	(2)+(3)	29.5	32.6	»
39.7	11.6	»	29.7	23.8	»	29.9	32.5	(3)
45.0	11.2	»	31.2	23.8	(3)	30.5	31.2	»
19.5	3.6**	(2)	32.0	23.4	»	32.0	28.7	»
20.8	8.8**	»	33.5	22.9	»	33.2	27.2*	»
25.0	6.5**	»						

* Indicates that equilibrium was approached from above. ** Indicates incomplete equilibrium.

Results similar to the above are also given for 60°. A number of determinations between 20° and 40° were made to fix the transition temperatures in this region.

The following results for the solubility of **Ammonium bicarbonate** in water are taken from the tables.

t°.	Gms. $NH_4 H CO_3$ per 100 gms. sat. sol.	Solid Phase.
0	11.1	$NH_4 . H CO_3$
20	17.5	»
40	24.2	»
60	30.0	»

Solubility of Ammonia in Hydrogen Peroxide Determined by the Freezing-Point Method. (Maass and Hatcher, 1922.)

By means of a gas buret definite volumes of ammonia were added to weighed quantities of pure hydrogen peroxide, and the freezing-points of the resulting mixtures were accurately determined.

t° of f. pt.	Gms. NH_3 per 100 gms. mixture.	Solid Phase.	t° of f. pt.	Gms. NH_3 per 100 gms. mixture.	Solid Phase.
— 1.72.....	0.0	H_2O_2	9.6..	48.6	$NH_3.H_2O_2$
—13	3.41	»	1.5..	49.7	»
—18	4.31	»	0.0..	50.7	»
+48 Eutec.	8.0 approx.	»+$NH_3.H_2O_2$	— 6.0..	51.8	»
+ 5	18.0	$NH_3.H_2O_2$	— 9.5..	52.8	»
8	19.8	»	—32 ..	56.7	»
15	21.1	»	—53.5..	59.5	»
20	23.9	»	below —78 ..	61.3	»
24.5 m. pt.	30.0 approx.	»	» » ..	68.7	»

100 cc. of *rubber* saturated with ammonia at 21° dissolve 930 cc. NH_3 (0° and 760mm). The determination was made by pumping out the gas with a Töpler pump and measuring it over mercury. Results for the effect of pressure and temperature upon the solubility are also given. (Veneble and Fuwa, 1922.)

Reciprocal solubilities determined by the freezing-point or the synthetic method are given for the following systems.

Ammonia + NH_4Br, NH_4Cl and NH_4I. (Kendall and Davidson, 1922.)
» + Ammonium Perchlorate. (Mazetti and Decarli, 1926.)
» + Ammonium Thiocyanate. (Foote and Hunter, 1920.)

AMMONIUM ACETATE CH_3COONH_4.

Solubility in Aqueous Solutions of Acetic Acid. (Sugden, 1926.)

t°	Gms. per 100 gms. sat. sol. CH_3COOH.	Gms. per 100 gms. sat. sol. CH_3COONH_4	Solid Phase.	t°	Gms. per 100 gms. sat. sol. CH_3COOH.	Gms. per 100 gms. sat. sol. CH_3COONH_4.	Solid Phase.
0...	3.7	63.8	CH_3COONH_4	16...	38.1	42.5	$CH_3COONH_4.CH_3COOH$
0...	15.8	61.1*	»	16...	57.3	32.6	»
0...	19.6	48.9	$CH_3COONH_4.CH_3COOH$	16...	72.3	27.3	»
0...	61.6	28.1	»	25...	2.15	70.6	CH_3COONH_4
16...	0.91	67.8	CH_3COONH_4	25...	12.0	67.0	»
16...	7.73	64.4	»	25...	21.1	63.3	»
16...	16.0	62.6	»	25...	31.3	58.9*	»
16...	19.7	61.1*	»	25...	23.2	60.7	$CH_3COONH_4.CH_3COOH$
16...	23.9	59.6*	»	25...	36.2	48.5	»
16...	17.1	61.1	$CH_3COONH_4.CH_3COOH$	25...	47.6	41.0	»
16...	21.7	55.6	»	25...	59.9	33.2	»
16...	22.7	54.3	»				

* Indicates unstable equilibrium.

AMMONIUM Phenoxy**ACETATE.**

AMMONIUM *o* Iodo**BENZOATE**, etc.

Solubility of Each in Water, Methyl Alcohol and in Ethylalcohol at 20°.

(Mc Master and Pratte, 1922.)

Salt.	Formula.	Gms. salt p r 100 gms. Water.	CH_3OH.	C_2H_5OH.
Ammonium Phenoxyacetate	$C_6H_5O.CH_2COONH_4$.....	13.03	3.97	0 44
» *p* Nitrophenylacetate	$pNO_2.C_6H_4CH_2.COONH_4$...	7.41	15.14	1.82
» *o* Iodo Benzoate	$oI.C_6H_4COONH_4$.....	67.11	184.10	63.37
» *o* Methoxy »	$o\ CH_3O.C_6H_4.COONH_4$....	38.25	17.85	4.82
» 1.2.4 Dinitro »	1.2.4 $(NO_2)_2C_6H_3COONH_4$...	62.70	21.39	3.85
» 2.5 Dichlorobenzene Sulfonate	$C_6H_2Cl_2.SO_3.NH_4$.....	11.30	20.15	2.59
» 4 Nitrochlorobenzene-2-Sulfonate	$C_6H_3.NO_2.ClSO_3NH_4$.....	4.72	2.76	0.96

AMMONIUM Di BORATE, Penta BORATE, etc.

Equilibria in the System Ammonia, Boric Anhydride and Water at Various Temperatures.

(At 30°, Sborgi, 1912 and 1913; at 30° and 60°, Sborgi and Mecacci, 1915 and 1916; at 0° and 10°, Sborgi and Mezzetti, 1921; at the other temperatures, Sborgi and Ferri, 1921 and 1922.)

The numerous determinations were plotted on cross section paper and the following tables constructed from the curves.

Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Solid Phase at Each Temperature.
$(NH_4)_2O$.	B_2O_3.	$(NH_4)_2O$.	B_2O_3.	$(NH_4)_2O$.	B_2O_3.	$(NH_4)_2O$.	B_2O_3.	
t = 0°.		t = 10°.		t = 20°.		t = 30°.		
0.0	1.46	0.0	1.96	0.0	2.70	0.0	3.60	H_3BO_3
0.2	2.2	0.2	3.0	0.2	3.7	0.2	4.7	»
0.3	2.8	0.4	4.0	0.4	4.8	0.5	6.1	»
0.37	3.26	0.5	4.4	0.5	5.5	0.8	7.6	»+1.5.8
0.5	3.5	0.8	5.0	1.0	6.4	1.5	8.8	1.5.8
0.75	4.0	1.2	5.9	1.5	7.6	2.2	10.5	»
1.0	4.5	1.6	7.1	2.0	8.9	3.0	12.7	»
1.3	5.4	2.0	8.2	2.8	10.8	3.8	15.3	»+1.2.4
1.0	4.0	1.8	7.0	2.5	9.0	3.5	13.3	1.2.4
0.9	3.2	1.6	5.0	2.2	6.7	3.0	9.0	»
1.0	2.8	1.5	3.6	2.5	4.2	4.0	6.0	»
2.0	2.5	2.0	3.0	3.0	3.8	6.0	5.0	»
4.0	2.3	4.0	2.6	4.0	3.3	10.0	3.5	»
10.0	1.8	10.0	2.0	10.0	12.4	15.0	2.5	»
20.0	1.0	20.0	1.1	20.0	1.4	20.0	1.8	»
t = 40°		t = 45°.		t = 60°.		t = 90°.		
0.0	4.5	0.0	5.3	0.0	7.4	0.0	13.5	H_3BO_4
0.5	6.8	0.5	8.0	0.5	10.4	1.0	18.0	»
0.9	9.5	1 0	10.6	1.4	15.6	2.4	25.0	»+1.5.8
1.5	9.9	1.5	11.0	2.0	16.0	3.0	25.4	1.5.8
2.0	10.7	2.0	11.9	3.0	15.7	4.0	26.5	»
3.0	13.0	3.0	14.0	3.5	19.0	5.0	28.4	»
3.5	14.7	3.6	16.4	4.0	20.6	6.1	31.5	»+1.4.6
3.8	15.3	4.0	16.9	5.0	22.0	8.0	34.0	1.4.6
4.0	15.6	4.5	17.6	6.0	23.8	10.0	36.8	»
4.5	16 3	5.0	18.5	7.0	26.0	12.0	39.7	»
4.9	17.5	5.6	19.8	7.9	27.8	12.8	40.7	»+1.2.4
4.2	12.0	5.0	14.0	7.5	21.0	13.0	39.0	1.2.4
6.0	7.6	6.0	9.0	8.0	17.0	14.0	35.0	»
10.0	5.0	10.0	6.0	10.0	12.6	16.0	28.5	»
20.0	2.4	20.0	3.0	20.0	5.6	20.0	23.3	»
30.0	1.0	30.0	1.6	30.0	3.0	30.0	19.0	»

1.5.8 = $(NH_4)_2O.5B_2O_3.8H_2O$; 1.2.4 = $(NH_4)_2O.2B_2O_3.4H_2O$; 1.4.6 = $(NH_4)_2O.4B_2O_3.6H_2O$.

The authors also made numerous determinations at 31°, 31°.5, 32° and 35° in order to ascertain the composition of solutions in contact with the 1.4.6 compound near its transition temperature.

The cryohydric points are as follows :

	Gms. per 100 gms. sat. sol.				Gms. per 100 gms. sat. sol.		
t°.	$(NH_4)_2O$.	B_2O_3.	Solid Phase.	t°.	$(NH_4)_2O$.	B_2O_3.	Solid Phase.
−1.37..	0.58	3.92	Ice+1.5.8	− 1.30...	1.01	1.03	Ice + 1.2.4
−1.25..	0.36	3.02	» + »+H_3BO_3	− 8.5....	3.57	0.85	»
−2.05..	1.21	4.97	» + »+1.2.4	−15.0....	17.61	0.57	»
−1.08..	0.54	1.47	» +1.2.4	+31 tr. pt.	3.63	13.59	1.5.8+1.4.6+1.2.4

Solubility of Ammonium Pentaborate and of Ammonium Diborate in Water. (Sborgi and Ferri, 1921; Sborgi and Gallichi, 1924.)

Results for Pentaborate. $(NH_4)_2O.5B_2O_3.8H_2O$.

t°.	Gms. $(NH_4)_2O.5B_2O_3$ per 100 gms. sat. sol.	t°.	Gms. $(NH_4)_2O.5B_2O_3$ per 100 gms. sat. sol.
− 1.37 (cryo.)..	3.92	40..	11.40
0.....	3.95	45..	12.81
10.....	5.39	60..	18.25
20.....	7.07	75..	24.40
30.....	9.10	90..	30.29
35.....	10.02		

Results for Diborate. $(NH_4)_2O.2B_2O_3.4H_2O$.

t°.	Gms. $(NH_4)_2O.2B_2O_3$ per 100 gms. sat. sol.	t°.	Gms. $(NH_4)_2O.2B_2O_3$ per 100 gms. sat. sol.
− 1.08 (cryo.)..	3.62	35..	13.02
0.....	3.75	40..	15.77
10.....	5.26	45..	18.41
20.....	7.63	60..	27 interp.
25.....	9.00	65..	30.80
30.....	10.80	90..	52.68

Simultaneous Solubility of Ammonium Diborate and Other Salts in Water at 0°, 10° and 25°. (Sborgi and Franco, 1921.)

	Gms. equivalents per 1000 gms. mols. H_2O.				
°.	NH Cl.	Na Cl.	$Na_2B_4O_7$.	$(NH_4)_2B_4O_7$.	Solid Phase.
0.	97.92	.....	.....	4.35	$(NH_4)_2B_4O_7.4H_2O$ + NH_4Cl
0.	.....	.....	1.52	6.38	» + $Na_2B_4O_7.10H_2O$
0.	.....	108.06	0.85	.....	NaCl + »
0.	49.33	85.79	1.58	.....	» + » + NH_4Cl
0.	58.71	69.14	1.92	.....	$Na_2B_4O_7.10H_2O$ + NH_4Cl
0.	68.87	48.82	1.97	.....	» »
0.	74.10	40.57	2.92	.....	» »
0.	87.14	21.22	3.77	.....	» » + $(NH_4)_2B_4O_7.4H_2O$
0.	74.98	17.06	3.57	.....	» + $(NH_4)_2B_4O_7.4H_2O$
0	48.71	10.84	3.22	.....	» »
10.	.....	.....	2.35	9.88	» »
10.	111.66	.....	.....	5.06	NH_4Cl + »
10.	.....	109.22	0.97	.....	NaCl + $Na_2B_4O_7.10H_2O$
10.	39.20	91.52	2.25	.....	» »
10.	61.38	80.33	2.34	.....	» » + NH_4Cl
10.	76.50	51.42	3.99	.....	$Na_2B_4O_7.10H_2O$ + »
10.	91.50	30.14	5.00	.....	» »
10.	95.05	25.98	6.30	.....	» » + $(NH_4)_2B_4O_7.4H_2O$
10.	73.94	18.09	5.71	.....	» + $(NH_4)_2B_4O_7.4H_2O$
10.	58.70	12.35	4.74	.....	» »
10.	112.7	0.03	4.41	.....	NH_4Cl + »
25.	132.10	.....	.....	10.40	» »
25.	.....	.....	6.25	19.96	$Na_2B_4O_7.10H_2O$ + »
25.	.....	109.53	1.80	.....	» + Na Cl
25.	85.16	71.49	9.80	.....	» + » + NH_4Cl
25.	97.99	50.00	13.00	.....	» + NH_4Cl
25.	105.52	38.32	14.83	.....	» + » + $(NH_4)_2B_4O_7.4H_2O$
25.	93.90	32.00	13.90	.....	» + $(NH_4)_2B_4O_7.4H_2O$
25.	78.90	25.00	12.80	.....	» »

The authors discuss the application of the results to the technical production of borax and elaborate this phase of the subject in a subsequent paper. (Sborgi and Franco, 1922.)

Reciprocal Solubility of Ammonium Diborate and Ammonium Sulfate in Water at the Cryohydric Temperatures. (Sborgi and Bovalini, 1924.)

	Gms. equiv. per 100 gms. mols. H_2O.		Gms. per 100 gms. H_2O.		Gms. per 100 gms. sat. sol.		
t°.	$(NH_4)_2SO_4$.	$(NH_4)_2B_4O_7$.	$(NH_4)_2SO_4$.	$(NH_4)_2B_4O_7$.	$(NH_4)_2SO_4$	$(NH_4)_2B_4O_7$.	Solid Phase.
−19.34.	179.53	2.441	65.79	1.300	39.68	1.28	$(NH_4)_2B_4O_7.4H_2O$ + $(NH_4)_2SO_4$ + Ice
−16.32.	180.50	3.50	66.15	1.865	39.81	1.83	$(NH_4)_2B_4O_7.4H_2O$ + $(NH_4)_2SO_4$

Reciprocal Solubility of Ammonium Biborate and Ammonium Sulfate in Water at Several Temperatures. (Sborgi and Gallichi, 1924.)

Results at 10°: Gms. per 100 gms. sat. sol.		Results at 20°: Gms. per 100 gms. sat. sol.		Results at 30°: Gms. per 100 gms. sat. sol.		
$(NH_4)_2SO_4$.	$(NH_4)_2B_4O_7$.	$(NH_4)_2SO_4$.	$(NH_4)_2B_4O_7$.	$(NH_4)_2SO_4$.	$(NH_4)_2B_4O_7$.	Solid Phase at Each Temperature.
0.0	5.255	3.25	6 39	0.0	20.88	$(NH_4)_2B_4O_7.4H_2O$
8.295	3.018	22.80	3.204	16.31	13.73	»
37.09	1.807	38 369	2.48	31.29	10.01	»
41.10	1.60	41.40	2.36	41.14	8.60	»+$(NH_4)_2SO_4$
42.20	0.0	42.99	0.0	45.77	0.0	$(NH_4)_2SO_4$

Results at 25°: Gms. per 100 gms. sat. sol.		Results at 35°: Gms. per 100 gms. sat. sol.		
$(NH_4)_2SO_4$.	$(NH_4)_2B_4O_7$.	$(NH_4)_2SO_4$.	$(NH_4)_2B_4O_7$.	Solid Phase at Each Temperature.
0.0	8.998	0.0	13.02	$(NH_4)_2B_4O_7.4H_2O$
5.17	6.747	1.594	11.803	»
13.07	5.10	2.518	11.326	»
23.865	4.052	14.92	7.413	»
29.65	3.518	19.50	6.672	»
37.186	3.1388	25.19	5 881	»
41.20	2.886	36.38	4.70	»
41.62	2.83	41.56	4.214	»+$(NH_4)_2SO_4$
42.17	2.016	43.17	1.69	$(NH_4)_2SO_4$
43.06	0 65	44.22	0.0	»
43.41	0.0			»

The cryohydric temperature of the system $(NH_4)_2B_4O_7 + Na_2B_4O_7 + Ice$ is — 1°.22 and 100 gms. of the saturated solution contain 3.472 gms. of $(NH_4)_2B_4O_7$ and 0.6447 gm. of $Na_2B_4O_7$. (Sborgi and Gallichi, 1924.)

Reciprocal Solubility of Ammonium Biborate and Sodium Biborate in Water at Various Temperatures. (Sborgi and Gallichi, 1924.)

	Gms. per 100 gms. sat. sol.				Gms. per 100 gms. sat. sat.		
t°.	$Na_2B_4O_7$.	$(NH_4)_2B_4O_7$.	Solid Phase.	t°.	$Na_2B_4O_7$.	$(NH_4)_2B_4O_7$.	Solid Phase.
0..	0.844	3.216	AB.4+SB.10	45..	10.00	18.62	AB.4+SB.10
10..	1.37	1.20	SB.10	45..	8.38	8.45	SB.10
10..	1.24	4.32	»	50.5	12.3	21.21	AB.4
10..	1.237	4.91	»+AB.4	50.5	13.83	21.16	»+SB.10
10..	0.93	4.96	AB.4	50.5	13.74	21.10	»+SB.5
16..	1.83	6.60	»+SB.10	50.5	13.31	18.18	SB.10
20..	2.22	7.73	» »	55..	13.23	23.58	AB.4
30..	3.42	11.02	AB.4	55..	17.46	23.47	»+SB.5
30..	4.08	11.19	»+SB.10	55..	17.33	19.62	SB.5
30..	3.86	8.81	SB.10	55..	17.30	19.30	SB.5+SB.10
25..	1.19	9.12	AB.4	55..	15.92	13.52	SB.10
25..	2.96	9.26	»	55..	14.03	5.88	»
25..	3.07	9.27	»+SB.10	57..	17.60	24.60	AB.4+SB.5
25..	3.06	8.77	SB.10	57..	17.27	15.88	SB.5
25..	3.03	8.16	»	57..	17.25	14.28	»+SB.10
25..	3.01	7.73	»	57..	16.29	11.07	SB.10
25..	2.97	6.26	»	65..	18.62	29.00	AB.4
35..	3.42	13.27	AB.4	65..	19.36	28.94	»+SB.5
35..	5.54	13.42	»+SB.10	65..	19.25	22.01	SB.5
35..	5.12	9.82	SB.10	65..	18.70	10.70	»
35..	4.63	3.29	»	65..	18.30	5.33	»

AB.4 = $(NH_4)_2B_4O_7.4H_2O$; SB.10 = $Na_2B_4O_7.10H_2O$; SB.5 = $Na_2B_4O_7.5H_2O$.

EQUILIBRIUM IN THE SYSTEM $(NH_4)_2B_4O_7 + Na_2SO_4 \rightleftharpoons Na_2B_4O_7 + (NH_4)_2SO_4$.
(Sborgi, Bovalini and Medici, 1924; Sborgi, 1924)

Results for aqueous solutions saturated with respect to :

	$(NH_4)_2B_4O_7.4H_2O + (NH_4)_2SO_4$ Gms. equiv. per 1000 gms. mols. H_2O.		$(NH_4)_2B_4O_7.4H_2O + Na_2B_4O_7.10H_2O$ Gms. equiv. per 1000 gms. mols. H_2O.		$Na_2B_4O_7.10H_2O + Na_2SO_4.10H_2O$ Gms. equiv. per gms. mols. H_2O.	
t°.	$(NH_4)_2SO_4$.	$(NH_4)_2B_4O_7$.	$Na_2B_4O_7$.	$(NH_4)_2B_4O_7$.	$Na_2B_4O_7$.	Na_2SO_4.
—10....	184.0	4.900	.....	.....	.....	.....
0.....	189.0	5.00	1.657	6.594	1.789	12.67
+10.....	195.45	5.257	2.349	9.801	1.384	23.319
15.....	198.42	6.50	3.22	12.797	2.326	32.222
25.....	204.23	9.563	6.25	19.88	2.627	72.27
25.65....	204.0	10.0	6.08	19.83	2.50	75.64
26.....	204.5	10.3	7.5	21.3	3.0	78.0
30.....	207.0	12.0	10.0	25.5	3.25	104.36
35.....	208.94	14.607	12.214	31.138	4.266	123.59[b]
38.7....	212.98	18.5	16.6	37.5	5.50	119.72[b]
40.....	212.42	20.5	18.8	40.0	6 0	118.5 [b]
41.....	214.0	20.5	19.0	41.0	6.25	118.0 [b]
41.7....	214.5	22.5	21.0	42 36	6.80	117.17[b]
45.....	218.0	26.5	25.0	49.0	8.381	114.57[b]
50.....	223.14	32.141	37.0	60.0	12.467	110.51[c]
55.....	228.0	38.0	52.86	74.73[a]	16.26	108.0 [c]
55.7....	229.0	40.0	53.25	76.26[a]	17.0	107.3 [c]

[a] Solid Phase $(NH_4)_2B_4O_7.4H_2O + Na_2B_4O_7.5H_2O$. [b] Solid Phase $Na_2B_4O_7.10H_2O + Na_2SO_4$.
[c] Solid Phase $Na_2B_4O_7.5H_2O + Na_2SO_4$.

	$(NH_4)NaSO_4.\frac{1}{2}H_2O + Na_2SO_4.10H_2O + Na_2B_4O_7.10H_2O$. Gms. equiv. par 1000 gms. mols. H_2O.			$(NH_4)NaSO_4.4H_2O + (NH_4)_2B_4O_7.4H_2O + Na_2B_4O_7.10H_2O$. Gms. equiv. per 1000 gms. mols. H_2O.		
t°.	$(NH_4)_2SO_4$.	Na_2SO_4.	$Na_2B_4O_7$.	$(NH_4)_2SO_4$.	Na_2SO_4.	$Na_2B_4O_7$.
—10.5..	157.67	14.44	3.09	166.15	10.68	2.76
—10....	156.12	14.828	3.259	157.245	14.328	2.80
0....	129.73	26.30	4.70	132.13	25.0	5.0
+10....	106.39	42.54	5.25	116.494	37.148	7.577
15....	93.0	59.0	5.50	113.56	43.80	9.35
25....	62.630	104.573	5.884	114.0	53.182	14.979
25.65.	62.13	108.76	6.0[a]	113.93	53.21	15.98
26....	63 5	107.4	7.6[b]	113.5	54.5	15.5
26....	61.0	110	3.5[c]	60.0	109	6.5[d]
30....	73.0	101.5	11.0[b]	114.0	57.5	19.5
35....	89.817	89.849	17.571[b]	116.786	60 219	28.187
38.7..	118.45	63.73	36.49[e] (30°)	20.0	119.0	4.5[d]

[a] Solid Phase $(NH_4)NaSO_4.4H_2O + Na_2SO_4.10H_2O + Na_2SO_4 + Na_2B_4O_7.10H_2O$.
[b] » » + $Na_2B_4O_7.10H_2O$ + » »
[c] » » + $Na_2SO_4.10H_2O$ + » »
[d] » $Na_2B_4O_7.10H_2O$ + » + »
[e] » » + $(NH_4)NaSO_4.4H_2O$ + » + $(NH_4)_2B_4O_7.10H_2O$.

	$(NH_4)NaSO_4.\frac{1}{2}H_2O + Na_2SO_4 + (NH_4)_2B_4O_7.\frac{1}{2}H_2O$. Gms. equiv. per 1000 gms. mols. H_2O.			$(NH_4)_2B_4O_7.4H_2O + Na_2SO_4 + Na_2B_4O_7.10H_2O$. Gms. equiv. per 1000 gms. mols. H_2O		
t°.	$(NH_4)_2SO_4$.	Na_2SO_4.	$(NH_4)_2B_4O_7$.	$(NH_4)_2SO_4$.	Na_2SO_4.	$Na_2B_4O_7$.
40....	135.09	79.81	27.75	119.50	62.25	42.25
41.7..	152.42	74.45	28.65	111.78	69.65	48.43[a]
45.0..	165.76	76.42	33.25	121.44	58.80	52.90[b]
50.0..	171.08	84.99	43.63	128.54	42.46	67.29[b]
55.0..	168.61	99.26	60.53	140.63	26.78	94.09[b]

[a] Solid Phase also contains, $Na_2B_4O_7.5H_2O$. [b] Solid Phase $(NH_4)_2B_4O_7.4H_2O + Na_2SO_4 + Na_2B_4O_7.5H_2O$.

EQUILIBRIUM IN THE SYSTEM $(NH_4)_2B_4O_7 + Na_2SO_4 \rightleftharpoons Na_2B_4O_7 + (NH_4)_2SO_4$ (*Con.*).

Results for aqueous solutions saturated with respect to :

$(NH_4)_2B_4O_7.4H_2O + (NH_4)NaSO_4.4H_2O + (NH_4)_2SO_4$.				$(NH_4)_2B_4O_7.4H_2O + (NH_4)NaSO_4.4H_2O + (NH_4)_2SO_4$.			
	Gm. equiv. per 1000 gm. mols. H_2O.				Gm. equiv. per 1000 gm. mols. H_2O.		
t°.	$(NH_4)_2SO_4$.	Na_2SO_4.	$(NH_4)_2B_4O_7$.	t°.	$(NH_4)_2SO_4$.	Na_2SO_4.	$(NH_4)_2B_4O_7$.
—10.5.	177.52	9.71	2.60	35...	195.54	44.41	17.54
—10...	177.55	9.85	2.60	38.7.	195.21	49.21	21.26
0...	182.918	18.101	4.685	40...	194.5	51.5	23.0
+10...	187.654	23.778	6.047	41...	192.98	54.0	24.62
15...	189.25	27.0	7.25	41.7.	192.80	54.9	25.7
25...	193.89	34.0	10.11	45...	190.65	63.0	31.0
25.65	193.68	34.69	11.15	50...	184.06	78.13	42.40
26...	193.0	35.0	11.5	55...	170.22	98.42	60.37
30...	195.0	38.5	13.0	55.7.	168.28	101.28	62.84*

(*) Na_2SO_4 also in Solid Phase.

The authors also give results for the solubility of the individual salts in water at the above temperatures, and for mixtures of ammonium and sodium sulfates with the double salt $(NH_4)NaSO_4$. Determinations of the transformation temperatures in the above system are given by Sborgi and Stefanini, 1924.

AMMONIUM BROMIDE NH_4Br.

100 gms. glycerol of $d_{20} = 1.2326$ dissolve 31.9 gms. NH_4Br at 20°. (Holm, 1922.)
» 1.2645 » 27.2 » »

AMMONIUM Platinum BROMIDE $(NH_4)_2PtBr_6$.

SOLUBILITY IN WATER. (Archibald and Kern, 1917.)

t°.	Gms. $(NH_4)_2PtBr_6$. per 100 gms. H_2O.	t°.	Gms. $(NH_4)_2PtBr_6$. per 100 gms. H_2O.	t°.	Gms. $(NH_4)_2PtBr_6$. per 100 gms. H_2O.
0.2.....	0.4165	29.7.....	0.8147	70.0.....	1.9265
7.3.....	0.5002	40.0.....	1.0355	80.0.....	2.3002
19.0.....	0.6438	50.0.....	1.2087	90.0.....	2.8370
25.0.....	0.7384	60.0.....	1.5780	99.0.....	3.5866

SOLUBILITY IN AQUEOUS SOLUTIONS OF AMMONIUM BROMIDE AT 20°. (Archibald and Kern, 1917.)

Gms. mols. NH_4Br per liter.	Gms. $(NH_4)_2PtBr_6$ per 100 gms. solvent.
0.10	0.0359
0.20	0.0168
1.00	0.0080
2.00	0.0032

AMMONIUM Tin BROMIDES Mono = $NH_4SnBr_3.H_2O$; Di = $(NH_4)_2SnBr_4.H_2O$; Tetra = $(NH_4)_4SnBr_6.H_2O$.

SOLUBILITY OF STANNOUS MONO AMMONIUM BROMIDE IN WATER. (Rimbach and Fleck, 1916.)

	Gms. per 100 gms. sat. sol.			
t°.	Br.	Sn.	NH_4.	Solid Phase.
0.1....	15.16	4.95	1.91	$NH_4.SnBr_3.H_2O + SnBr_2.H_2O$
17.7....	19.23	7.03	2.29	» »
36.8....	26.73	11.51	2.54	» »
56.7....	40.84 +	20.30 +	3.06 = 64.2 gms.	$NH_4SnBr_3.H_2O$
74.6....	49.43 +	25.56 +	3.71 = 77.7 gms.	»

At temperatures below 56°.7 the atomic ratios of Br : Sn : NH_4 did not correspond to the double salt hence in these cases the solid phase was a mixture of the double salt and stannous bromide.

Solubility of Stannous Diammonium Bromide in Water

(Rimbach and Fleck, 1916.)

t°.	Gms. per 100 gms. sat. sol. Br.	Sn.	NH_4.	Solid Phase.	
0.2.....	21.57	1 99	4.26	$(NH_4)_2SnBr_4.H_2O$	$+SnBr_2.H_2O$
14.4.....	26.65	4.49	4 65	»	»
36.6.....	38.87	10 19	5.69	»	»
60.6.....	48.70	16.01	6.13	»	»
80.5.....	52.21	+ 19.36	+ 5.91 = 77.4 gms.	$(NH_4)_2SnBr_4.H_2O$	

The ratio of Br : Sn : NH_4 in solution, corresponding to the double salt, was reached only at temperatures above 60°.6.

Solubility of Stannous Tetra Ammonium Bromide in Water.

(Rimbach and Fleck, 1916.)

t°.	Gms. per 100 gms. sat. sol. Br.	Sn.	NH_4.	Solid Phase.	
1.8.....	30.33	0.65	6.65	$(NH_4)_4SnBr_6.H_2O$	$+SnBr_2.H_2O$
16.0.....	34.62	2.00	7.21	»	»
73.3.....	52.52	10.37	8.71	»	»
91.6.....	56.66	13.53	8.68	»	»

The atomic ratio Br : Sn : NH_4 corresponding to the double salt was not reached below 91°.6.

Tetra methyl**AMMONIUM BROMIDE** $(CH_3)_4NBr$.

100 cc. pure Ethyl urethan dissolve 0.22 gm. $(CH_3)_4NBr$ at 60°. (Stuckgold, 1917.)

Perhaloid**AMMONIUM BROMIDES**, etc.

Solubility of Each in Acetic Acid at 38°.

(Mc Combie and Reade, 1923.)

Compound.				Formula.	Gms. cmpd. per liter.
Phenyl trimethyl Ammonium Bromide			Di Chloride...	$N(C_6H_5)(CH_3)_3BrCl_2$	50.0
»	»	»	Di Bromide...	$N(C_6H_5)(CH_3)_3BrBr_2$	8.0
»	»	»	Di Iodide.....	$N(C_6H_5)(CH_3)_3BrI_2$	6.5
»	»	»	Iodo Bromide.	$N(C_6H_5)(CH_3)_3BrIBr$	6.6
»	»	»	Chloride Iodo Chloride.	$N(C_6H_5)(CH_3)_3ClICl$	13.3
»	»	»	Iodide Iodo Iodide...	$N(C_6H_5)(CH_3)_3I_3$	1.6

AMMONIUM CARBONATE $(NH_4)_2CO_3$.

Solubility of Ammonium Carbonate in Aqueous Solutions of Ammonium Chloride and Vice Versa.

(Mondain Monval, 1922.)

Results at 0°. Gms. per 100 gms. H_2O.			Results at 15°. Gms. per 100 gms. H_2O.		
NH_4Cl.	$\frac{1}{2}(NH_4)_2CO_3$.	Solid Phase.	NH_4Cl.	$\frac{1}{2}(NH_4)_2CO_3$.	Solid Phase.
0.00	55.8	$(NH_4)_2CO_3$	10.1	62.0	$(NH_4)_2CO_3$
26.4	56.7	$+NH_4Cl$	14.5	61.2	»
27.2	13.0	NH_4Cl	31.3	61.0	$+NH_4Cl$
29.2	0.0	»	31.7	17.6	NH_4Cl

Solubility of Ammonium Carbonate in Aqueous Solutions of Sodium Carbonate and Vice Versa.

(Mondain Monval, 1922.)

Results at 0°. Gms. per 100 gm. H_2O.			Results at 15°. Gms. per 100 gms. H_2O.		
$\frac{1}{2}Na_2CO_3$.	$\frac{1}{2}(NH_4)_2CO_3$.	Solid Phase.	$\frac{1}{2}Na_2CO_3$.	$\frac{1}{2}(NH_4)_2CO_3$.	Solid Phase.
18.0	64.2	$(NH_4)_2CO_3+Na_2CO_3$	4.3	59.2	$(NH_4)_2CO_3$
10.3	12.9	Na_2CO_3	15.9	65.2	$+Na_2CO_3$
6.9	0.5	»	27.6	16.3	Na_2CO_3
7.1	0.0	»	27.6	16.5	»

SOLUBILITY OF MIXTURES OF AMMONIUM CARBONATE, AMMONIUM CHLORIDE AND OTHER SALTS IN WATER AT 0° AND AT 15°. (Mondain Monval, 1922.)

Results at 0°: Gms. per 100 gms. H_2O.				Results at 15°: Gms. per 100 gms. H_2O.				Solid Phase at both temperatures.
Na.	NH_3.	Cl.	$^1/_2CO_3$.	Na.	NH_3.	Cl.	$^1/_2CO_3$.	
11.0	6.5	27.0	2.5	9.4	7.2	27.8	0.8	$NH_4Cl + NaCl$
11.7	10.9	23.1	14.1	13.6	10.8	30.2	10.2	» + » $+ Na_2CO_3$
14.6	1.7	21.1	4.2	13.3	6.0	23.3	7.7	$NaCl + Na_2CO_3$
9.7	11.0	21.7	12.6	12.7	14.3	28.2	16.6	NH_4Cl + »
9.2	38.4	22.6	56.6	18.5	39.4	38.5	57.2	» + » $+ (NH_4)_2CO_3$
6.2	34.8	19.9	49.4	10.3	35.4	31.2	46.0	» $+ (NH_4)_2CO_3$
1.8	31.1	17.5	39.3	2.3	31.7	21.4	37.7	» + »
6.8	24.5	4.8	45.4	10.9	38.8	21.4	60.8	Na_2CO_3 + »
2.3	10.1	19.9	3.1	4.1	12.0	23.7	5.4	NH_4Cl
7.0	6.4	12.6	9.1	10.6	10.7	21.7	13.8	Na_2CO_3
7.1	4.2	8.3	9.3	7.9	2.3	4.6	10.3	»
3.5	1.5	3.0	4.5	–	–	–	–	»

AMMONIUM BICARBONATE NH_4HCO_3.

SOLUBILITY OF AMMONIUM BICARBONATE IN WATER.

(Average curve from the results of Fedotieff, 1904; Nishizawa, 1920; Toporescu. 1922; and Fedotieff and Kolossoff, 1923.)

t°.	Gms. NH_4HCO_3. per 100 gms. H_2O.	t°.	Gms. NH_4HCO_3. per 100 gms. H_2O.	t°.	Gms. NH_4HCO_3. per 100 gms. H_2O.
0.....	11.9	20.....	20.8	35.....	31.0
5.....	13.6	25.....	23.7	40.....	33.2
10.....	16.0	30.....	27.0	45.....	40.2

SOLUBILITY OF AMMONIUM BICARBONATE AT 35° IN AQUEOUS SOLUTIONS OF:
(Fedotieff and Kolossoff, 1923.)

Ammonium Sulfate: d_{35} of sat. sol.	Gms. per 100 gms. H_2O. $(NH_4)_2SO_4$.	NH_4HCO_3.	Solid Phase.	Sodium Bicarbonate. d_{35} of sat. sol.	Gms. per 100 gms. H_2O. $NaHCO_3$.	NH_4HCO_3.	Solid Phase.
1.19	28.73	22.95	NH_4HCO_3	1.11	0.0	31.08	NH_4HCO_3
1.23	37.19	21.18	»	1.16	7.12	29.32	» + $NaHCO_3$
1.26	56.71	17.00	»	1.15	7.38	28.72	$NaHCO_3$
1.34	75.78	15.57	» + $(NH_4)_2SO_4$	1.11	9.51	9.78	»
1.32	77.31	10.18	$(NH_4)_2SO_4$	1.11	10.59	3.99	»
1.25	80.74	0.00	»	1.08	11.66	0.00	»

100 gms. H_2O simultaneously saturated at 15° with:

Ammonium Bicarbonate + Ammonium Chloride contain 7.02 gms. NH_4HCO_3 + 35.4 gms. NH_4Cl
» » + Sodium Bicarbonate » 19.6 » + 6.2 gms. $NaHCO_3$

The following results were obtained for water simultaneously saturated with three salts at 15°.

Gms. per 100 gms. H_2O.				Solid Phase.
NH_3.	Na.	HCO_3.	Cl.	
11.2	3.4	5.9	24.5	$NH_4HCO_3 + NaHCO_3 + NH_4Cl$
6.6	10.5	1.2	29.3	$NaCl$ + » + »

(Toporescu, 1922.)

Simultaneous Solubility of Ammonium Bicarbonate and Other Salts

(Nishizawa, 1920.)

t°	Gm. mols. per 1000 gm. mols. H_2O. $(NH_4)_2SO_4$	NH_4HCO_3	Solid Phase.
15..	96.40	14.90	$(NH_4)_2SO_4+NH_4HCO_3$
30..	99.27	24.60	» »
40..	100.9	34.0	» »

t°	Gm. mols. per 1000 gm. mols. H_2O. $NaHCO_3$	NH_4HCO_3	Solid Phase.
15..	12.79	38.92	$NaHCO_3+NH_4HCO_3$
30..	12.38	37.96	» »
40..	15.87	70.83	» »

t°	Gm. mols. per 1000 gm. mols. H_2O. Na_2SO_4.	$(NH_4)_2SO_4$.	$NaHCO_3$.	Solid Phase.
15.....	12.46	67.08	20.90	$NH_4HCO_3+NaHCO_3+Na_2SO_4.(NH_4)_2SO_4.4H_2O$
30.....	11.27	87.04	27.56	» » »
40.....	10.03	109.1	34.59	» » »
15.....	6.79	97.99	14.96	» $+(NH_4)_2SO_4+$ »
30.....	8.68	104.06	24.66	» » »
40.....	9.79	109.2	35.48	» » »

AMMONIUM PerCHLORATE NH_4ClO_4.

Solubility of Ammonium Perchlorate in Water.

(Mazzucchelli and Rosa, 1921; Freeth, 1924.)

t°	Gms. NH_4ClO_4 per 100 gms. sat. sol.		t°	Gms. NH_4ClO_4 per 100 gms. sat. sol.	
− 2.72 (Eutec.).	9.84 (M and R)	9.8 (Freeth)	45.1...	27.64 (M and R)	28.02 (Freeth)
0.0.....	10.73 »	10.74 »	55.2...	31.55 »	–
+15.2.....	15.95 »	–	65.1...	35.37 »	–
25.0.....	19.89 »	20.02 »	75.0...	39.05 »	39.45 »
34.0.....	23.32 »	–	84.7...	42.54 »	–

Solubility of Ammonium Perchlorate in Aqueous Solutions of Ammonium Sulfate and Vice Versa.

(Freeth, 1924.)

Results at 25°. Gms. per 100 gms. sat. sol. $(NH_4)_2SO_4$.	NH_4ClO_4.	Solid Phase.	Results at 60°. Gms. per 100 gms. sat. sol. $(NH_4)_2SO_4$.	NH_4ClO_4.	Solid Phase.
0.0	20.02	NH_4ClO_4	7.04	28.56	NH_4ClO_4
11.06	13.11	»	11.89	24.91	»
22.45	8.15	»	16.69	21.66	»
33.75	4.25	»	23.71	17.02	»
41.70	3.00	» $+(NH_4)_2SO_4$	30.8	12.6	»
42.83	1.22	$(NH_4)_2SO_4$	40.92	8.2	» $+(NH_4)_2SO_4$
43.5	0.0	»	44.12	3.48	$(NH_4)_2SO_4$

Solubility of Ammonium Perchlorate in Aqueous Solutions of Sodium Perchlorate and Vice Versa.

(Freeth, 1924.)

Results at 25°. Gms. per 100 gms. sat. sol. $NaClO_4$.	NH_4ClO_4.	Solid Phase.	Results at 60°. Gms. per 100 gms. sat. sol. $NaClO_4$.	NH_4ClO_4.	Solid Phase.
9.29	15.07	NH_4ClO_4	12.35	25.78	NH_4ClO_4
25.85	9.54	»	25.0	18.00	»
43.64	4.87	»	37.34	12.54	»
52.86	3.50	»	56.95	6.30	»
67.42	1.51	» $+NaClO_4H_2O$	72.86	1.87	« $+NaClO_4$
67.60	0.0	$NaClO_4H_2O$	74.30	0.00	$NaClO_4$

Complete data for the quaternary equilibria in the system $NH_4ClO_4 + (NH_4)_2SO_4 + NaClO_4 + Na_2SO_4 + H_2O$ at 25° and 60° are given by Freeth, 1924.

SOLUBILITY OF AMMONIUM PERCHLORATE IN WATER AND IN SEVERAL ANHYDROUS SOLVENTS AT 25°. (Willard and Smith, 1923.)

Solvent.	$d_{\frac{25}{4}}$ of solvent.	$d_{\frac{25}{4}}$ of sat. sol.	Gms. NH_4ClO_4 per 100 gms. sat. sol.	Solvent.	$d_{\frac{25}{4}}$ of solvent.	$d_{\frac{25}{4}}$ of sat. sol.	Gms. NH_4ClO_4 per 100 gms. sat. sol.
Water.....	—	1.0982	19.95	*n* Butyl alcohol..	0.8059	0.8069	0.017
Methyl alcohol..	0.78735	0.8218	6.41	*iso* Butyl alcohol.	0.7981	0.7988	0.127
Ethyl alcohol...	0.78515	0.79505	1.872	Acetone.....	0.7852	0.7997	2.21
n Propyl alcohol	0.7993	0.8016	0.385	Ethyl acetate....	0.8945	0.8947	0.032

SOLUBILITY OF AMMONIUM PERCHLORATE IN MIXTURES OF METHYL ALCOHOL AND ETHYL ACETATE AT 25°. (Smith, 1925.)

Volume per cent CH_3OH in Solvent.	Gms. NH_4ClO_4 per 100 gms. sat. sol.	Volume per cent CH_3OH in Solvent.	Gms. NH_4ClO_4 per 100 gms. sat. sol.
0.0 (=pure $CH_3COO.C_2H_5$)	0.029	60.0	4.35
10.0	0.135	70.0	5.08
20.0	0.550	80.0	5.67
30.0	1.27	90.0	6.12
40.0	2.31	100.0	6.42
50.0	3.47		

AMMONIUM CHLORIDE NH_4Cl.

THE ICE CURVE FOR THE SYSTEM AMMONIUM CHLORIDE-WATER. (Rodebush, 1918.)

The temperatures were measured with a thermoelement and the concentrations determined by conductivity.

t° of lowering of f. pt.	Gms. NH_4Cl per 100 gms. H_2O.	t° of lowering of f. pt.	Gms. NH_4Cl per 100 gms. H_2O.	t° of lowering of f. pt.	Gms. NH_4Cl per 100 gms. H_2O.
0.0.....	0.0	— 8.60.....	13.76	—12.60.....	19.93
—5.73.....	9.28	—10.58.....	16.89	—14.03.....	22.40
—7.63.....	12.27	—11.80.....	18.80	—15.10.....	24.13
—7.80.....	12.56	—12.44.....	19.94	—15.36(Eutec.)	24.50

Similar determinations for concentrations of NH_4Cl up to 0.5 normal are given by Klein and Svanberg, 1920.

The heterogeneous equilibria in the quarternary system Ammonium Chloride + Ammonium Sulfate + Sodium Chloride + Sodium Sulfate + Water at 0°, 25°, 40°, 60° and 80° are given by Rivett, 1922.

100 gms. H_2O dissolve 97.2 gms. NH_4Cl + 1000 gms. NH_4NO_3 at 100°. (Wurmser, 1922.)

THE SYSTEM AMMONIUM CHLORIDE + COBALT CHLORIDE + WATER AT 60°. (Clendinnen, 1922.)

The temperature 60° was chosen in order to avoid the presence of hydrates higher than the dihydrate and thus simplify the study of the series of mixed crystals which are formed. Both the saturated solutions and the solid phases were analyzed.

d of sat. sol.	Gms. per 100 gms. sat. sol. NH_4Cl.	Gms. per 100 gms. sat. sol. $CoCl_2$.	% NH_4Cl in mixed crystals (extrapolated).	*d* of sat. sol.	Gms. per 100 gms. sat. sol. NH_4Cl.	Gms. per 100 gms. sat. sol. $CoCl_2$.	% NH_4Cl in mixed crystals (extrapolated).
1.164	29.10	10.11	96.2	1.580	3.44	47.44	12.7
1.240	25.25	17.53	88.8	1.575	2.59	48.06	8.0
1.329	21.32	25 86	67.6	1.592	2.21	48.21	6.7
1.362	18.15	30.66	55.8	1.587	1.79	48.37	2.6
1.380	17.74	31.24	52.7 (unstable)	1.585	0.90	48.62	1.1
—	14.96	34.84	45.2 »	—	16.87	30.94	40.0
1.454	13.08	37.05	37.9 »	1.401	14.21	33.66	40.0
1.482	10.36	40.14	31.0	1.414	13.57	34.36	38.8
1.504	9.04	41.42	29.4	—	12.93	35.02	38.8
1.530	6.90	43.56	25.0	—	12.56	35.64	38.8
1.559	5.02	45.74	21.2	—	11.80	37.01	38.4

The System Ammonium Chloride + Cupric Chloride + Water.

(Rivett and Clendinnen, 1923.)

Results at $0°.2 \pm 0°.1$.

$d_{\frac{25}{4}}$ of sat. sol.	Gms. per 100 gms. sat. sol. NH_4Cl	Gms. per 100 gms. sat. sol. $CuCl_2$	Gms. per 100 gms. undissolved residue. NH_4Cl	Gms. per 100 gms. undissolved residue. $CuCl_2$
1.078	22.59	0.91	82.4	2.29
1.084	22.28	1.62	41.8	38.6
1.117	13.69	7.57	34.8	42.2
1.178	7.49	15.09	34.9	44.6
1.273	2.95	24.46	32.1	44.6
1.392	1.19	33.86	26.8	45.3
1.495	0.76	41.7	1.70	48.9
1.498	0.75	40.8	0.49	52.1

Results at $25° \pm 0°.1$.

$d_{\frac{25}{4}}$ of sat. sol.	Gms. per 100 gms. sat. sol. NH_4Cl	Gms. per 100 gms. sat. sol. $CuCl_2$	Gms. per 100 gms. undissolved residue. NH_4Cl	Gms. per 100 gms. undissolved residue. $CuCl_2$
1.086	28.02	0.995	73.3	1.51
1.092	27.69	1.78	45.6	24.9
1.093	26.86	2.05	36.1	38.1
1.114	19.59	6.41	34.9	40.0
1.145	15.26	19.96	34.0	40.8
1.191	10.94	16.35	28.9	37.2
1.263	6.53	23.76	27.5	40.2
1.378	3.16	33.2	27.6	44.7
1.524	1.82	43.3	8.08	53.2
–	1.79	43.3	13.64	51.5
1.523	1.44	43.2	0.88	57.2

These results show that the supposed compound $2\,NH_4Cl.CuCl_2.2\,H_2O$ exists only in a very narrow region of the mixed crystals.

The System Ammonium Chloride + Ferric Chloride + Water.

(Clendinnen, 1923.)

Results at 25°.

$d_{\frac{25}{4}}$ of sat. sol.	Gms. per 100 gms. sat. sol. NH Cl.	Gms. per 100 gms. sat. sol. $FeCl_3$.	Solid Phase.
1.132	24.14	7.64	Mixed crystals Series AB
1.177	21.19	13.26	
1.228	18.54	19.27	
1.327	16.05	28.97	B and C
1.358	16.63	30.45	
1.356	15.59	31.61	Mixed crystals Series CD
1.369	13.41	33.46	
1.412	8.70	38.10	
1.455	5.13	42.82	
1.513	2.93	47.63	
1.536	2.29	49.50	$D + FeCl_3.6H_2O$
1.525	1.30	48.80	$FeCl_3.6H_2O$

Results at 60°.

$d_{\frac{25}{4}}$ of sat. sol.	Gms. per 100 gms. sat. sol. NH Cl.	Gms. per 100 gms. sat. sol. $FeCl_3$.	Solid Phase.
1.133	31.37	7.75	Mixed crystals Series AB
1.268	25.40	22.95	
1.298	24.73	25.78	B and C
1.310	22.49	27.47	Mixed crystals Series CD
1.418	10.57	39.20	
1.534	4.56	53.10	
1.639	8.85	65.08	
1.643	9.50	65.30	$D + NH_4Cl.FeCl_3$
1.620	8.57	65.70	$NH_4Cl.FeCl_3$
1.677	3.78	69.47	
1.745	1.57	75.37	
1.793	0.40	77.36	$NH_4Cl.4FeCl_3.6H_2O$
–	0.18	78.20	» $+FeCl_3.2H_2O$
1.798	0.00	78.42	$FeCl_3.2H_2O$

The existence of the alleged compound $2\,NH_4Cl.FeCl_3.H_2O$ has not been confirmed, but a series of mixed crystals with narrow limits, the members of which approximate this compound, has been found.

The System Ammonium Chloride + Ferrous Chloride + Water at 70°.

(Clendinnen, 1922.)

d of sat. sol.	Gms. per 100 gms. sat. sol. NH Cl.	Gms. per 100 gms. sat. sol. $FeCl_2$.	% NH_4Cl in mixed crystals (extrapolated).
1.162	31.39	9.52	86.0
1.260	24.24	19.78	69.3
1.307	19.97	25.22	50.9
1.338	17.04	28.38	43.6
1.362	14.99	30.53	40.0
1.420	10.23	36.05	37.1
1.475	7.28	40.72	31.6
1.479	6.72	41.37	26.5
1.485	6.28	41.98	24.1
1.520	4.19	44.71	18.0
–	2.69	46.42	8.0
1.533	1.33	46.66	$FeCl_2.4H_2O$

The System Ammonium Chloride + Manganous Chloride + Water at 60°.

(Clendinnen and Rivett, 1921.)

d of sat. sol.	Gms. per 100 gms. sat. sol. NH_4Cl	Gms. per 100 gms. sat. sol. $MnCl_2$.	Solid Phase.
1.105	33.52	2.91	Mixed crystals Series AF
1.129	31.93	5.84	
1.183	29.50	10.16	
1.192	27.81	12.95	
1.200	27.07	13.79	F and G
1.210	25.28	15.91	Mixed crystals Series GH
1.239	22.51	18.81	
1.267	19.04	22.42	
1.317	14.33	27.74	
1.365	10.52	32.80	
1.426	7.55	38.02	
1.482	5.44	43.10	
1.543	3.93	47.20	
1.575	2.94	49.33	
1.581	2.45	50.22	H and K
1.583	2.21	50.68	Mixed crystals Series KD
1.592	1.61	51.16	
1.619	0.91	51.47	

The solid phases lie on the line connecting the compositions of pure ammonium chloride and the dihydrate of manganous chloride. The system is of a somewhat uncommon type. There are three very well-defined series of mixed crystals, namely, AF, GH, and KD with two gaps, FG and HK. The composition of the alleged compound $2\,NH_4Cl.MnCl_2.2\,H_2O$ is well within the second series GH. The authors also give a very complete series of determinations at 25° which supplement those of Foote and Saxton, published in 1914.

In a later paper Clendinnen and Rivett, 1923, give results upon a critical solution temperature for solids in the binary system ammonium chloride-manganous chloride dihydrate. Eight isotherms between 10° and 60° were studied and the results of the analyses of the solutions and wet solid phases are given. The percentage of ammonium chloride in the solution and solid phases were plotted and the isothermal distribution curves thus obtained. These show regions of homogeneous single-phase mixed crystals and also a heterogeneous region. This latter was studied in considerable detail.

Data for the quaternary system Ammonium Chloride + Mercuric Chloride + Potassium Chloride + Water at 25° are given by Osaka and Ando, 1924.

The System Ammonium Chloride + Nickel Chloride + Water at 70°.

(Clendinnen, 1922.)

d of sat. sol.	Gms. per 100 gms. sat. sol. NH Cl.	Gms. per 100 gms. sat. sol. $NiCl_2$.	Per cent NH_4Cl in mixed crystals (extrapolated).
1.162	30.92	8.59	98.3
1.234	26.09	15.83	94.6
1.294	22.91	21.29	93.9
1.355	20.47	26.28	84.6
1.386	19.01	28.96	75.1
1.401	18.37	30.03	68.8
1.411	17.54	30.69	62.5
1.409	17.57	30.70	57.2
1.421	16.93	31.31	52.5
1.446	15.05	33.54	45.1
1.469	13.56	33.22	39.3
1.492	11.74	36.99	34.8
1.510	10.09	38.88	31.4
1.530	8.43	40.43	28.1
1.552	6.96	42.05	25.9
–	5.35	43.87	21 8
1.591	4.62	44.70	0.9
1.587	2.79	44.99	0.4
1.589	1.24	45.60	0.1
1.592	0.0	45.8	0 0

Solubility of Ammonium Chloride in Aqueous Solutions of Sodium Chloride and Vice Versa.

(Mondain Monval, 1922.)

t°.	Gms. per 100 gms. H_2O. NaCl.	NH$_4$Cl.	Solid Phase.	t°.	Gms. per 100 gms. H_2O. NaCl.	NH$_4$Cl.	Solid Phase.
0.....	0.0	29.7	NH_4Cl	15.....	0.0	35.3	NH_4Cl
0.....	8.6	24.5	»	15.....	15.7	25.5	»
0.....	26.1	15.7	» +NaCl	15.....	24.7	20.3	» +NaCl
0.....	35.6	0.0	NaCl	15.....	27.2	16.9	NaCl
10.6...	23.86	20.0	NH_4Cl	15.9....	28.9	16.0	»
18.25..	24.05	22.3	»	24.1....	29.1	16.0	»

Simultaneous Solubility in Water of Ammonium Chloride and Sodium Chloride.

t°.	Gms. per 100 gms. H_2O. NaCl.	NH Cl.	Solid Phase.	Authority.
0.....	27.86	14.55	NaCl + NH_4Cl	(Sborgi and Franco, 1921.)
10.....	26.33	18.03	» »	» »
15.....	27.2	20.3	» »	(Toporescu, 1922.)
25.....	25.04	24.09	» »	(Sborgi and Franco, 1922.)
100.....	19.5	61.5	» »	(Mlle Wurmser, 1922.)

Data for the simultaneous solubility in water at 100° of Ammonium chloride, Ammonium nitrate, Sodium chloride and Sodium nitrate are given by Mlle Wurmser, 1922.

100 gms. of *glycerol* of $d_{20} = 1.2356$ dissolve 12.58 gms. NH_4Cl at 20° (Holm. 1922.)
» » » $= 1.2645$ » 10.17 » » » » »

100 cc of a sat. sol. of ammonium chloride in pure *ethyl urethan* contain 0.131 gm. NH_4Cl at 60°. (Stuckgold, 1917.)

Fusion-point data (solubilities see foot-note, p. 1001) are given for the following mixtures :

$NH_4Cl + SbCl_3$ (Kendall, Crittenden and Miller, 1923)
» $+ NH_4NO_3$ (Perman, 1922).
» + » $+ NaNO_3$ »
» $+ NaCl$ + » »
» $+ NH_4NO_3$ (Bowen, 1926.).
» $+ CdCl_2$ (Hackmeister, 1920.)
» $+ CuCl$ »

$NH_4Cl + HgCl$ (Janecke, 1923.)
» $+ HgCl_2$ »
» $+ AgCl$ »
» $+ FeCl_3$ (Hackmeister, 1920.)
» $+ LiCl$ »
» $+ ZnCl_2$ »

AMMONIUM Iridium CLORIDE $(NH_4)_2IrCl_6$.

Solubility in Water. (Archibald and Kern, 1917.

t°.	Gms. $(NH_4)_2IrCl_6$ per 100 gms. H_2O.	t°.	Gms. $(NH_4)_2IrCl_6$ per 100 gms. H_2O.
0.2.....	0.5561	40.0.....	1.5665
10.0.....	0.7055	50.0.....	1.9664
25.0.....	1.0910	60.0.....	2.4567
30.0.....	1.2066	80.0.....	4.3815

Decomposition occurs at higher temperatures.

Solubility in Aqueous Solutions of Ammonium Chloride at 20°.

(Archibald and Kern, 1917.)

Gm. mols. NH_4Cl per liter.	Gms. $(NH_4)_2IrCl_6$ per 100 gms. solvent.	Gm. mols. NH_4Cl per liter.	Gms. $(NH_4)_2IrCl_6$ per 100 gms solvent.
0.10	0.1793	1.00	0.0064
0.20	0.0780	2.00	0.0027

AMMONIUM Platinum CHLORIDE $(NH_4)_2PtCl_6$.

Solubility in Water. (Archibald and Kern, 1917.)

t°.	Gms. $(NH_4)_2PtCl_6$ per 100 gms. H_2O.	t°.	Gms. $(NH_4)_2PtCl_6$ per 100 gms. H_2O.	t°.	Gms. $(NH_4)_2PtCl_6$ per 100 gms. H_2O.
0.0.....	0.2900	30.0.....	0.6370	70.0.....	1.7440
5.0.....	0.3550	40.0.....	0.8050	80.0.....	2.1605
10.0.....	0.3745	50 0.....	1.0250	90.0.....	2.6150
20.0.....	0.5000	60.0.....	1.4405	100.....	3.3650

Solubility in Aqueous Solutions of Ammonium Chloride at 20°.

Gms. Mols NH_4Cl per liter.	Gms. $(NH_4)_2PtCl_6$ per 100 gms. solvent.	Gms. Mols NH_4Cl per liter.	Gms. $(NH_4)_2PtCl_6$ per 100 gms. solvent.
0.10	0.0423	1.00	0.0028
0.20	0.0186	2.00	0.0024

AMMONIUM TinCHLORIDES

Mono = $NH_4SnCl_3.H_2O$; Di = $(NH_4)_2SnCl_4.H_2O$; Tetra = $(NH_4)_4SnCl_6.H_2O$

Solubility of Stannous Monoammonium Chloride in Water.

(Rimbach and Fleck, 1916.)

t°.	Gms. NH_4SnCl_3 per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. NH_4SnCl_3 per 100 gms. sat. sol.	Solid Phase.
1.2*....	57.0	$NH_4.SnCl_3.H_2O + SnCl_2$	36.9....	71.8	$NH_4SnCl_3.H_2O$
15.9*....	63.1	»	61.7....	80.0	»
			81.2....	85.8	»

Solubility of Stannous Diammonium Chloride in Water.

t°.	Gms. $(NH_4)_2SnCl_4$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $(NH_4)_2SnCl_4$ per 100 gms sat. sol.	Solid Phase.
1.6....	28.7	$(NH_4)_2SnCl_4.H_2O$	57.0....	61.8	$(NH_4)_2SnCl_4.H_2O$
14.5....	35.4	»	79.0....	73.0	»
36.6....	48.5	»			

Solubility of Stannous Tetrammonium Chloride in Water.

t°.	Gms. per 100 gms. sol. sat. Cl.	Sn.	NH_4.	Solid Phase.	
0.8*.....	16.31	1.16	7.95	$(NH_4)_4SnCl_6.H_2O + Sn_2Cl$	
19.1*.....	19.23	2.06	9.16	»	»
41.7*.....	21.95	6.62	9.16	»	»
58.1*.....	26.73	11.33	10.17	»	»
70.1*.....	30.05	15.15	10.70	»	»
81.3.....	31 98	+ 19.60	+ 10.30	= 61.9 gms. $(NH_4)_4SnCl_6$	

* At these temperatures the atomic ratios of Cl : Sn : NH_4 in solution do not correspond to the double salt, hence in these cases the solid phase is a mixture of the double salt and stannous chloride.

AMMONIUM CHROMATE $(NH_4)_2CrO_4$.

Solubility in Aqueous Solutions of Ammonia at 15°.

(Weitz and Stamm, 1925.)

The authors give several diagrams and a lengthy discussion of the solubility of ammonium chromate and other ammonium salts (bromide, chloride, chlorate, perchlorate, molybdate, nitrate, oxalate, sulfate, sulfite and dithionate) in aqueous solutions of ammonia. Some of the data are evidently taken from the literature and the rest are based on the experiments of Stamm. Numerical results are not given and the diagrams are not large enough to permit quantitative estimations. They show in general that the solubility of ammonium salts of monovalent acids increase and those of divalent acids decrease with increase of the concentration of ammonia.

THE SYSTEM AMMONIUM CHROMATE + AMMONIUM SULFATE + WATER AT 25°.

(Araki, 1925.)

Gms. per 100 gms. sat. sol. $(NH_4)_2SO_4$.	Gms. per 100 gms. sat. sol. $(NH_4)_2CrO_4$.	Solid Phase.
43.41	0.00	$(NH_4)_2SO_4$
39.73	3.67	Solid solutions
39.13	4.22	of $(NH_4)_2CrO_4$ in $(NH_4)_2SO_4$
39.11	4.23	Mixtures
39.96	4.36	of the two series
37.72	4.51	of solid solutions
38.06	4.88	
34.82	6.98	
30.81	9.04	Solid solutions
26.81	11.73	of $(NH_4)_2SO_4$
17.18	16.76	in $(NH_4)_2CrO_4$
14.47	17.76	
2.78	23.22	
0.00	25.16	$(NH_4)_2CrO_4$

THE SYSTEM AMMONIUM CHROMATE + POTASSIUM CHROMATE + WATER AT 25°.

(Araki, 1925.)

Gms. per 100 gms. sat. sol. K_2CrO_4.	Gms. per 100 gms. sat. sol. $(NH_4)_2CrO_4$.	Solid Phase.
39.35	0.00	K_2CrO_4
36.77	1.41	
34.38	3.25	
29.36	6.75	Series
25.89	10.01	of solid solutions
22.35	12.85	of $(NH_4)_2CrO_4$
18.64	16.51	in K_2CrO_4
16.07	19.10	
15.84	19.95	
15.82	19.98	Mixtures
15.20	20.18	of the two series
14.55	20.36	of solid solutions
14.47	20.40	
14.14	20.70	Series
11.69	21.30	of solide solutions
10.63	21.94	of K_2CrO_4
7.08	22.88	in $(NH_4)_2CrO_4$
4.53	23.43	

A STUDY OF THE RECIPROCAL SALT PAIR $[(NH_4)_2, K_2] — [CrO_4, SO_4]$ AT 25°.

(Ishikawa, 1926.)

Previous experiments have shown that $K_2SO_4 + K_2CrO_4$ and also $(NH_4)_2SO_4 + K_2SO_4$ each form a complete series of solid solutions with no gap, while $(NH_4)_2CrO_4 + (NH_4)_2SO_4$ and $(NH_4)_2CrO_4 + K_2CrO_4$ each form a series of solid solutions with gaps respectively at 2.90 to 21.51 and 16.75 to 55.50 molar percentages of ammonium chromate. The present experiments were made by adding to a solution in equilibrium with two kinds of solid solutions of two salts having a common ion, another salt in different proportion, in such a manner that when equilibrium is attained, two or three solid phases remained as residue. The mixtures were rotated in a thermostat for at least two days. The results of the analyses are given in a table and plotted in the Janecke square diagram.

AMMONIUM Lanthanum **CHROMATE** $3(NH_4)_2CrO_4.La(CrO_4)_3.5H_2O$.

Data showing that the range of existance of the double ammonium lanthanum chromate is in the presence of aqueous solutions containing from 5.06 to 23.22 per cent of ammonium chromate, are given by Carobbi, 1926.

AMMONIUM Di **CHROMATE** $(NH_4)Cr_2O_7$.

SOLUBILITY OF AMMONIUM DICHROMATE IN WATER.

t°.	Gms. $(NH_4)_2Cr_2O_7$ per 100 gms. sat. sol.	Authority.
16.....	23.88	Moles and Gonzalez, 1923
25.....	28.63	» »
30.....	32.05	Schreinemakers, 1905

AMMONIUM FORMATE $HCOONH_4$.

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given for mixtures of ammonium formate and formic acid by Kendall and Adler, 1921.

AMMONIUM HELIANTHATE $C_{14}H_{14}N_3SO_3NH_4.2H_2O$.

1000 cc. of water saturated at 20°–25° with respect to ammonium helianthate contain 6.0 gms. $C_{14}H_{14}N_3SO_3.NH_4.2H_2O$. (Stark and Dehn, 1918.)

AMMONIUM IODIDE NH_4I.

Tetra methyl and Tetra ethyl **AMMONIUM IODIDES** $(CH_3)_4NI$ and $(C_2H_5)_4NI$.

Solubility of Each in Ethyl Urethan at 60°. (Stuckgold, 1917.)

Compound.	Formula.	Gms. cmpd. per 100 cc. sat. sol.
Ammonium Iodide	NH_4I	9.00
Tetramethyl Ammonium Iodide	$(CH_3)_4NI$	0.45
Tetraethyl Ammonium Iodide	$(C_2H_5)_4NI$	1.63

AMMONIUM LAURATE $C_{11}H_{23}COONH_4$.

100 cc. of ethylene trichloride dissolve 0.23 gms. ammonium laurate at 0°, 0.57 gm. at 10° and 1.46 gm. at 20°. (Straüli, 1918, 1926.)

AMMONIUM Calcium **MECONATE** $NH_4.CaC_7HO_7.2H_2O$.

1 liter of a saturated solution of ammonium calcium meconate in aqueous 0.1 *n* ammonia contains 1.2783 gm. $NH_4CaC_7HO_7.2H_2O$ at 18°. (Heiduschka and Faul, 1917.)

AMMONIUM Tri and Tetra **MOLYBDATES** $(NH_4)_2O.3MoO_3.H_2O$ and $(NH_4)_2O\ 4MoO_3.2H_2O$.

Solubility of Each in Water at 15°. (Travers and Malaprade, 1926.)

Compound.	Formula.	Gms. anhydrous cmpd. per liter.
Ammonium trimolybdate	$(NH_4)_2O.3MoO_3.H_2O$	14.0
» tetramolybdate.	$(NH_4)_2O.4MoO_3.2H_2O$	9.5

AMMONIUM NITRATE NH_4NO_3.

Solubility in Water.

Rodenbush, 1918; Early and Lowry, 1919; Millican, Joseph and Lowry, 1922; Kazantzev, 1923, 1925; Mondain Monval, 1923, 1925; Cohen and Bredée, 1925.)

The various determinations were plotted on cross section paper and the following values taken from the curve. The determinations of M. J. and L. were made by the sealed tube method and also by use of a Beckmann apparatus. The results of C and B are claimed to be accurate to 0.02-0.03 per cent, and nearer correct than those of M M.

t°.	Gms. NH_4NO_3 per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. NH_4NO_3 per 100 gms. sat. sol.	Solid Phase.
— 5	12.7[a]	Ice	40.0	73.7[b] (74.2)[c]	NH_4NO_3 III
—10	26.0	»	45.0	75.34 (76.1)	»
—15	38.6	»	50.0	77.0 (77.8)	»
—16.67(Eutec.)	42.8	»+NH_4NO_3 IV	60.0	(80.7)	»
—10.0	47.7	NH_4NO_3 IV	70.0	(83.5)	»
— 5.0	51.2	»	80	86.4[c]	»
0.0	54.23[b]	»	84.2(tr. pt.)	87.0	»+NH_4NO_3 *x*
+ 5.0	57.23 (59.0)[c]	»	90	89.0	NH_4NO_3 *x*
10.0	60.05 (61.5)	»	100	91.4	»
15.0	62.76 (63.8)	»	110	93.4	»
20.0	65.24 (66.0)	»	120	95.0	»
25.0	67.63 (68.1)	»	125 (tr. pt.)	95.5	»+NH_4NO_3 *y*
30.0	69.90 (70.1)	»	130	96.5	NH_4NO_3 *y*
32.0	70.77 (71.0)	»	140	97.5	»
32.27(tr. pt.)	71.0 (71.0)	»+NH_4NO_3 III	150	98.7	»
33.0	71.12 (71.2)	NH_4NO_3 III	169.6	100.0	»
35.0	71.6 (72.0)	»			

[a] Determinations of Rodenbush. [b] Determinations of Cohen and Bredee. [c] Determinations of Millican, Joseph and Lowry. NH_4NO_3 IV corresponds to the α rhombic form and NH_4NO_3 III corresponds to the β rhombic form of other writers. Millican, Joseph and Lowry designate as γ the form of the salt which is stable between 32° and 84°.

Solubility of Ammonium Nitrate in Aqueous Solutions of Ammonium Acid Sulfate at 25°.

(Wöhler and Schäffer, 1925.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
NH_4NO_3.	NH_4HSO_4.	Solid Phase.	NH_4NO_3.	NH_4HSO_4.	Solid Phase.
59.0	13.9	NH_4NO_3	30.1	51.1	$NH_4NO_3.NH_4HSO_4$
52.5	25.5	»	27.3	58.8	»
45.5	36.6	»	23.3	62.5	NH_4HSO_4
35.8	47.9	$NH_4NO_3.NH_4HSO_4$	16.9	66.1	»
32.3	49.1	»	8.2	69.5	»

The authors also give the following results for the solubility of the double salt $NH_4NO_3.NH_4HSO_4$ in water at different temperatures.

t°.....	20.	30.	40.	50.	60.
Gms. $NH_4NO_3.NH_4HSO_4$ per 100 gms. sat. sol.	82.9	84.6	86.9	89.3	92.6

Equilibrium in the System: Ammonium Nitrate + Ammonium Thiocyanate + Ammonia. (Foote and Brinkley, 1921.)

The mixtures were shaken at constant temperatures and the saturated solutions analyzed by titrating the ammonia, using Congo Red as indicator, and the thiocyanate by the Volhard method. The NH_4NO_3 was estimated by difference.

Results at 0°.		Results at 10°.		Results at 20°.		
Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		
NH_3.	NH_4CNS.	NH_3.	NH_4CNS.	NH_3.	NH_4CNS.	Solid Phase at each temperature
22.88	77.12	22.70	77.30	21.35	78.65	NH_4CNS
20.96	69.88	20.11	71.49	19.59	75.72	»
19.60	64.95	17.85	64.66	18.12	70.24	»
19.05	61.72	17.28	61.64	15.20	60.00	»+NH_4NO_3
19.97	59.97	18.52	56.37	17.73	54.37	NH_4NO_3
23.70	44.58	21.87	44.53	20.37	42.38	»
24.70	37.15	23.06	34.53	21.20	29.64	»
24.75	24.55	23.32	21.70	21.15	19.47	»
24.22	9.64	22.55	8.80	21.13	14.20	»
23.13	0.0	21.91	0.0	20.55	0.00	»

Solubility of Ammonium Nitrate in Aqueous Solutions of Barium Nitrate and Vice Versa at 30°. (de Baat, 1918.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$Ba(NO_3)_2$.	NH_4NO_3.	Solid Phase.	$Ba(NO_3)_2$.	NH_4NO_3.	Solid Phase.
0.0	70.1	NH_4NO_3	4.85	42.17	$Ba(NO_3)_2$
3.71	67.18	»	4.82	41.70	»
4.02	66.81	»+$Ba(NO_3)_2$	4.23	21.82	»
4.62	59.27	$Ba(NO_3)_2$	5.09	9.95	»
4.83	52.39	»	10.4	0.0	»

Equilibrium in the System $NH_4NO_3 + Ba(NO_3)_2 + AgNO_3 + H_2O$ at 30°.

(de Baat, 1918.)

Gms. per 100 gms. sat. sol.				Gms. per 100 gms. sat. sol.			
$AgNO_3$.	NH_4NO_3.	$Ba(NO_3)_2$.	Solid Phase.	$AgNO_3$.	NH_4NO_3.	$Ba(NO_3)_2$.	Solid Phase.
6.45	62.79	3.53	$NH_4NO_3+Ba(NO_3)_2$	67.31	6.17	2.33	$Ba(NO_3)_2+AgNO_3$
14.13	57.91	3.10	» »	13.66	59.38	1.97	» »
38.34	34.70	2.15	» »	43.45	32.82	1.32	NH_4NO_3
49.50	26.94	1.74	D + »	66.15	8.63	1.04	D
61.60	15.08	1.90	» »	35.49	30.58	3.88	$Ba(NO_3)_2$

D = $AgNO_3.NH_4NO_3$.

Solubility of Ammonium Nitrate in Aqueous Solutions of Copper Nitrate and Vice Versa at 30° and at 40°.

(Schreinemakers, Berkhoff and Posthumus, 1924.)

Results at 30°.

Gms. per 100 gms. sat. sol. $Cu(NO_3)_2$.	Gms. per 100 gms. sat. sol. NH_4NO_3.	Solid Phase.
0.0	71.18	NH_4NO_3
9.80	59.95	»
26.37	44.82	»
33.96	39.95	»
38.07	38.35	»
43.01	38.24	»
43.90	40.60	» + D
45.04	39.21	D
45.30	38.8	» + $Cu(NO_3)_2.2^1/_2H_2O$
50.00	27.41	$Cu(NO_3)_2.2^1/_2H_2O$
55.80	12.75	»
61.00	0.0	»

Results at 40°.

Gms. per 100 gms. sat. sol. $Cu(NO_3)_2$.	Gms. per 100 gms. sat. sol. NH_4NO_3.	Solid Phase.
0.0	74.0	NH_4NO_3
8.2	65.2	»
14.17	58.4	»
36.8	43.6	»
42.0	43.9	» + D
43.9	41.7	D
48.0	36.7	»
47.9	36.7	» + $Cu(NO_3)_2.2^1/_2H_2O$
48.1	36.4	$Cu(NO_3)_2.2^1/_2H_2O$
50.7	24.1	»
56.9	11.9	»
62.6	0.0	»

D = $Cu(NO_3)_2.[NH_4NO_3]_3$. The authors criticise the results of Meyer, 1924, who did not analyze the solid phases and failed to detect the double salt D. They also think that $Cu(NO_3)_2.3H_2O$, reported by Meyer, does not exist.

Solubility of Ammonium Nitrate in Aqueous Solutions of Nitric Acid.

(Kazantzev, 1923, 1925.)

Saturation was obtained by constant agitation for periods of 1 to 2 hours. Carefully purified materials were used.

Results at 0°.

Gms. per 100 gms. sat. sol. HNO_3.	Gms. per 100 gms. sat. sol. NH_4NO_3.
0.0	54.3
9.2	43.5
15.5	38.4
21.0	34.5
24.0	32.8
27.0	31.9
30.0	31.1
33.2	31.0
36.2	32.1
39.1	33.2
41.4	34.0
45.8	39 5
47.4	48.2

Results at 15°.

Gms. per 100 gms. sat. sol. HNO_3.	Gms. per 100 gms. sat. sol. NH_4NO_3.
0.0	62.4
0.7	61.1
2.8	59.1
7.7	53.3
9.0	52.0
16.4	45.7
21.7	42.2
27.1	40.9
31.5	39.2
36.7	39 9
39.0	40.8
44.0	46.8
45.0	52.5

Results at 30°.

Gms. per 100 gms. sat. sol. HNO_3.	Gms. per 100 gms. sat. sol. NH_4NO_3.
0.0	70.2
3.5	65.5
8.6	60.9
10.6	58.8
14.4	55.6
16.7	53.1
20.8	51.5
22.1	50.0
26.4	48.5
30.0	47.5
37.5	48.6
40.1	51.0
42.2	55.6

Results at 75°.

Gms. per 100 gms. sat. sol. HNO_3.	Gms. per 100 gms. sat. sol. NH_4NO_3.
0.0	84.1
12.8	73.7
16.0	71.8
26.3	67.5
31.6	66.8

20°

(Nichols, Howes et. al., 1919.)

0.0	65.63
3.98	60.16
8.81	55.95
14.65	51.17
21.46	46.35
28.33	43.35

The System Ammonium Nitrate + Potassium Nitrate + Water at 25°.

(Ando, 1925.)

Saturation was obtained by constantant rotation in a thermostat. The salts form two series of solid solutions with a gap.

Gms. per 100 gms. sat. sol. NH_4NO_3.	Gms. per 100 gms. sat. sol. KNO_3.	Solid Phase.
67.70	0.0	Solid solutions of NH_4NO_3 saturated with KNO_3
65.63	2.71	
61.41	7.26	
59.93	8.62	
54.80	13.95	
51.56	16.69	$KNO_3 + NH_4NO_3$
51.16	16.90	»
39.45	19.27	Solid solutions of KNO_3 saturated with NH_4NO_3
25.56	21.38	
13.48	23.53	

Similar, but apparently les accurate results, determined at the ordinary temperature, are given by Caillart, 1918.

Solubility of Ammonium and Potassium Nitrates and Sulfates in Water at 25°. (Osaka and Inouye, 1925.)

Mixtures of the salts in roughly calculated proportions were rotated in a thermostat for several days, and both the saturated solutions and the solid phases were analyzed. There are five series of solid solutions present as solid phases. These are

1. $(NH_4, K)_2SO_4$; 2. $(NH_4, K)_2(NO_3)_2\alpha$; 3. $(NH_4, K)_2(NO_3)_2\beta$;
4. $(NH_4, K)_2O.5SO_4.5(NO_3)_2$; 5. $(NH_4, K)_2O.4SO_4.6(NO_3)_2$.

Complete tables showing the composition of the liquid and solid phases for each of the five series of solid solutions are given. The results are presented in gram percentages, and in molal proportion according to the formula

$$100m\,H_2O.x\,K_2.(100-x)(NH_4)_2y\,SO_4.(100-y)(NO_3)_2.$$

Solubility of Ammonium Nitrate in Presence of Sodium Chloride. (Rengade, 1917, 1922.)

Equimolecular mixtures of $NH_4NO_3 + NaCl$ or of $NaNO_3 + NH_4Cl$ were evaporated at gradually increasing temperatures and the solutions analyzed after the separation of NaCl and before the appearance of NH_4Cl, which could be easily distinguished by its crystalline form. The four ions were determined and the results arbitrarily expressed in terms of $NH_4NO_3 + NaCl$.

	Gms. per 100 gms. H_2O.			Gms. per 100 gms. H_2O.			Gms. per 100 gms. H_2O.		
t°.	NH_4NO_3.	NaCl.	t°.	NH_4NO_3.	NaCl.	t°.	NH_4NO_3.	NaCl.	$NaNO_3$.
80*...	81	46	108*...	435	100	118...	750	140	0
98*...	128	56	111....	464	101	124...	2,015	320	35
100*...	139	59	115....	683	137	129...	3,500	427	29

* These solutions prepared from equimolecular mixtures of $NaNO_3 + NH_4Cl$, and the others from equimolecular mixtures of $NH_4NO_3 + NaCl$. The results were intended for use in the industrial preparation of NH_4NO_3.

Solubility of Mixtures of Ammonium Nitrate and Sodium Nitrate in Water. (Mondain Monval, 1925.)

	Gms. per 100 gms. H_2O.				Gms. per 100 gms. H_2O.		
t°.	$NaNO_3$.	NH_4NO_3.	Solid Phase.	t°.	$NaNO_3$.	NH_4NO_3.	Solid Phase.
12.67....	68.4	150.4	NH_4NO_3	9.95....	74.0	140	$NaNO_3$
18.48....	68.4	176.0	»	13.15....	76.68	140	»

100 gms. H_2O dissolve 1233 gms. $NH_4NO_3 + 333$ gms. $NaNO_3$ at 100°. (Wurmser, 1922.)

100 cc. Pyridine dissolve 22.88 gms. NH_4NO_3 at 25°. (Müller, R., 1924.)

Freezing-point lowering data (solubilities see foot-note, p. 1001) are given for:

$NH_4NO_3 + (NH_4)_2SO_4$	(Bowen, 1926.)
» + LiCl	(Perman and Harrison, 1924*a*.)
» + NaCl	(Perman, 1922.)
» + » + $NaNO_3$	» »
» + $NaNO_3$	(Perman, 1922; Earley and Lowry, 1922.)
» + Na_2SO_4	(Perman and Harrison, 1924.)
» + KCl	(Perman and Saunders, 1923.)
» + K_2SO_4	(Perman and Howells, 1923.)

AMMONIUM NITROSALICYLATE, 5.2.1 $NO_2C_6H_3(OH)COONH_4$.

AMMONIUM NAPHTHALENE SULFONATES α and β $C_{10}H_7SO_3NH_4$.

Solubility of Each in Water and in Methyl and Ethyl Alcohols at 20°. (Mc Master and Prattle, 1923; 1924.)

Compound.	Formula.	Gms. compound per 100 gms. H_2O.	Gms. compound per 100 gms. CH_3OH.	Gms. compound per 100 gms. C_2H_5OH.
Ammonium Nitrosalicylate 5.2.1....	$NO_2C_6H_3(OH)COONH_4$	4.43	4.41	1.96
» α-Naphtalene sulfonate.	$C_{10}H_7SO_3NH_4$	45.91	34.45	9.22
» β-Naphtalene sulfonate.	»	11.71	8.33	2.53

AMMONIUM Uranyl NITRATES $NH_4NO_3.UO_2(NO_3)_2$ and $2NH_4NO_3.UO_2(NO_3)_2$.

Solubility of Ammonium Uranyl Nitrates in Aqueous Nitric Acid at 20°. (Nichols, Hawes, et al, 1919.)

Results for $NH_4NO_3.UO_2(NO_3)_2$.

Per cent HNO_3 in solvent.	Gms. $NH_4NO_3.UO_2(NO_3)_2$ per 100 gms solvent.	Solid Phase.
0	165.0	$UO_2(NO_3)_2.6H_2O$
10	128.5	»
20	80 3	»
30	68.2	»
40	60 5	»
20	144.5	$NH_4NO_3.UO_2(NO_3)_2$
30	144.0	»
40	95.6	»
50	61.4	»
60	38.6	»

Results for $2NH_4NO_3.UO_2(NO_3)_2$.

Per cent HNO_3 in solvent.	Gms. $2NH_4NO_3.UO_2(NO_3)_2$ per 100 gms. solvent.	Solid Phase.
0	251.0	$UO_2(NO_3)_2.6H_2O$
10	201.0	»
20	150.0	»
30	144.0	»
0	380.0	$NH_4NO_3.UO_2(NO_3)_2$
10	380.0	»
20	215.0	»
30	150.0	»
40	98.2	»
50	58.0	»
60	35.6	»

Tetra methylAMMONIUM TriNITRIDE $N(CH_3)_4N_3$.

Approximate Solubility in Several Solvents at 20°. (Friedlander, 1918.)

Solvent.	Gms. $N(CH_3)_4N_3$ per 100 gms. sat. sol.	Solvent.	Gms. $N(CH_3)_4N_3$ per 100 gms. sat. sol.
Water	50.0	Benzene	0.4
Ethyl alcohol	5.0	Chloroform	0.1
Methyl alcohol	2.0	Ethyl ether	0.05

Excess of the salt in contact with carbon tetrachloride forms two layers, the lower of which contains 0.5 gm. $N(CH_3)_4N_3$ per 100 cc.

AMMONIUM OXALATE $(NH_4)_2C_2O_4.H_2O$.

Solubility in Water. (Koenig, 1922.)

t°	d of sat. sol.	Gms. $(NH_4)_2C_2O_4$ per 100 gms sat. sol.
15	1.014	3.53
16.5	1.016	3.99
17.8	1.0175	4.372
20	—	5.03

Solubility of Mixtures of Ammonium Oxalate and of Potassium Oxalate in Water. (Rivett and O'Conner, 1919.)

Results at 25°.

d of sat. sol.	Gms. per 100 gms. sat. sol. $K_2C_2O_4$.	Gms. per 100 gms. sat. sol. $(NH_4)_2C_2O_4$.	Solid Phase.
1.021	0.00	5.01	$(NH_4)_2C_2O_4.H_2O$
1.040	2.67	4.72	Solid solution of $K_2C_2O_4.H_2O$ in $(NH_4)_2C_2O_4.H_2O$ (I)
1.068	6 51	4.38	
1.108	12.10	4.01	
1.128	15.37	3.68	
1.166	19.39	3.32	
1.204	24.3	2.90	
1.217	25.9	2.75	(I) + (II)
1.216	26.3	1.83	Solid solution of $(NH_4)_2C_2O_4.H_2O$ in $K_2C_2O_4.H_2O$ (II)
1.216	26.8	0.85	
1.215	27.2	0.0	

Results at 50°.

d of sat. sol.	Gms. per 100 gms. sat. sol. $K_2C_2O_4$.	Gms. per 100 gms. sat. sol. $(NH_4)_2C_2O_4$.	Solid Phase.
1.034	0.0	9.63	$(NH_4)_2C_2O_4.H_2O$
1.080	7.99	8.40	Solid solution of $K_2C_2O_4.H_2O$ in $(NH_4)_2C_2O_4.H_2O$ (I)
1.136	16.20	7.10	
1.154	17.99	6.79	
1.187	22.4	6.10	
1.203	24.4	5.75	
1.254	30.4	4.78	(I) + (II)
1.251	31.0	3.34	Solid solution of $(NH_4)_2C_2O_4.H_2O$ in $K_2C_2O_4.H_2O$ (II)
1.252	31.5	2.64	
1.252	33.1	0.0	$K_2C_2O_4.H_2O$

No evidence was obtained of the existence of a double salt. The proportion of the two salts in the solid phases varies with the composition of the solution and the evidence is definite that mixed crystals of the two salts are formed.

SOLUBILITY OF AMMONIUM OXALATE IN AQUEOUS SOLUTIONS OF SODIUM OXALATE AND VICE VERSA.

(Rivett and O'Conner, 1919.)

Results at 25°.				Results at 50°.			
	Gms. per 100 gms. sat. sol.				Gms. per 100 gms. sat. sol.		
d of sat. sol.	$Na_2C_2O_4$.	$(NH_4)_2C_2O_4$.	Solid Phase.	d of sat. sol.	$Na_2C_2O_4$.	$(NH_4)_2C_2O_4$.	Solid Phase.
1.028	0.89	4.88	$(NH_4)_2C_2O_4.H_2O$	1.042	1.25	9.46	$(NH_4)_2C_2O_4.H_2O$
1.035	1.82	4.81	»	1.051	2.45	9.32	»
1.043	2.85	4.75	»	1.059	3.57	9.21	»
1.047	3.41	4 74	» + $Na_2C_2O_4$	1.063	4.05	9.19	» + $Na_2C_2O_4$
1.043	3.46	3.77	$Na_2C_2O_4$	1.056	4.13	7.86	$Na_2C_2O_4$
1.039	3.51	2.89	»	1.049	4 29	6.12	»
1.037	3.51	2.48	»	1.044	4.28	4.64	»
1.033	3.65	1 49	»	1.036	4.37	3.14	»
1.030	3.63	0.74	»	1.031	4.46	1.59	»
1.027	3.73	0.00	»	1.023	4.54	0.00	»

AMMONIUM PHOSPHATES Mono, $NH_4H_2PO_4$ and Di, $(NH_4)_2HPO_4$.

SOLUBILITY OF EACH IN WATER.

(Buchanan and Winner, 1920.)

Results for Monoammonium Phosphate.

	Gms. $NH_4H_2PO_4$ per 100 gms.	
t°.	Sat. sol.	H_2O.
0.....	18.5	22.7
10.....	22.8	29.5
20.....	27.2	37.4
30.....	31.7	46.4
40.....	36.2	56.7
60.....	45.2	82.5
80.....	54.2	118.3
100.....	63.4	173.2
110.5.....	68.3	215.0

Results for Diammonium Phosphate.

	Gms. $(NH_4)_2HPO_4$ per 100 gms.	
t°.	Sat. sol.	H_2O.
0.....	30.0	42.9
10.....	38.6	62.8
20.....	40.8	69.0
30.....	42.9	75.2
40.....	45.0	81.8
50.....	47.2	89.2
60.....	49.3	97.3
70.....	51.4	106.0

Additional determinations for monoammonium phosphate, agreeing fairly closely with the above, are given by Apfel, 1911.

SOLUBILITY OF MONOAMMONIUM PHOSPHATE IN AQUEOUS SOLUTIONS OF AMMONIUM SULFATE AT 25°. (Apfel, 1911.)

Mols. per 1000 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Mols. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
PO_4.	SO_4.	$NH_4H_2PO_4$.	$(NH_4)_2SO_4$.	PO_4.	SO_4.	$NH_4H_2PO_4$.	$(NH_4)_2SO_4$.
2.58	0.0	29.7	0.0	1.53	1.43	17.6	18.90
2.40	0.17	27.6	2.25	1.31	1.84	15.1	24.31
2.34	0.27	26.9	3.57	0.99	2.55	11.4	33.68
2.26	0.35	26.0	4.62	0.82	2.92	9.44	38.58
1.78	1.05	20.5	13.87	0.814	2.89	9.37	38.18

AMMONIUM MANGANESE PHOSPHATE $NH_4MnPO_4.H_2O$.

1000 cc. sat. solution of ammonium manganese phosphate in water contain 0.00042 gm. $NH_4MnPO_4.H_2O$ (temp. not stated). (Breuner, 1920, 1922.)

AMMONIUM STEARATE $CH_3(CH_2)_{16}COONH_4$.

100 cc. of ethylene trichloride dissolve 0.04 gm. ammonium stearate at 0°, 0.12 gm. at 10° and 0.31 gm. at 20°. (Strauli, 1918, 1926.)

AMMONIUM SULFATE $(NH_4)_2SO_4$.

Solubility in Water.

(Average curve from the results of Rodebush, 1918; Sborgi and Bovalini, 1924; Sborgi, Bovalini and Medici. 1924; Sborgi, 1924; Nishizawa, 1920; Britton, 1922; Caven and Mitchell, 1924; and Weston, 1922.)

t°.	Gms. $(NH_4)_2SO_4$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $(NH_4)_2SO_4$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $(NH_4)_2SO_4$ per 100 gms. sat. sol.	Solid Phase.
— 5.....	17.0	Ice	0 ..	41.35	$(NH_4)_2SO_4$	25...	43.3	$(NH_4)_2SO_4$
—10.....	28.0	»	+ 5...	41.65	»	30...	43.75	»
—15.....	36.0	»	10...	42.05	»	40 ..	44.7	»
—19 (Eutec.)	39.8	»+$(NH_4)_2SO_4$	15...	42.45	»	50...	45.8	»
—10.....	40.5	$(NH_4)_2SO_4$	20...	42.85	»	60...	47.0	»

Solubility of Ammonium Sulfate in Aqueous Solutions of Beryllium Sulfate at 25° and Vice Versa. (Britton, 1922*a*.)

Gms. per 100 gms. sat. sol. $BeSO_4$.	Gms. per 100 gms. sat. sol. $(NH_4)_2SO_4$.	Solid Phase.	Gms. per 100 gms. sat. sol. $BeSO_4$.	Gms. per 100 gms. sat. sol. $(NH_4)_2SO_4$.	Solid Phase.
0.0	43.45	$(NH_4)_2SO_4$	24 04	32.20	1.1.2
8.62	38.60	»	26.79	28.09	»+$BeSO_4.4H_2O$
16.04	35.88	»	26.68	24.99	$BeSO_4.4H_2O$
19.72	37.56	»+1.1.2	27.26	15.66	»
22.08	34 26	1.1.2	28.56	5.77	»
1.1.2 = $(NH_4)_2SO_4.BeSO_4.2H_2O$			29.94	0.0	»

Solubility of Ammonium Sulfate in Aqueous Solutions of Copper Sulfate at 25°, 51° and 61° and Vice Versa.

(Caven and Mitchell, 1924.)

t°.	Mols. per 100 gms. H_2O. $CuSO_4$.	Mols. per 100 gms. H_2O. $(NH_4)_2SO_4$.	Solid Phase.	t°.	Mols. per 100 gms. H_2O. $CuSO_4$.	Mols. per 100 gms. H_2O. $(NH_4)_2SO_4$.	Solid Phase.
25.	0.0	0.5801	$(NH_4)_2SO_4$	51.	0.00	0.6462	$(NH_4)_2SO_4$
25.	0.0042	0.5762	»+1.1.6	51.	0.180	0.6733	»+1.1.6
25.	0.0070	0.3826	1.1.6	51.	0.1302	0.1351	1.1.6
25.	0.0112	0.3233	»	51.	0.2365	0.0861	»+$CuSO_4.5H_2O$
25.	0.0507	0.0989	»	51.	0.2073	0 0000	$CuSO_4.5H_2O$
25.	0.0779	0.0779	»	61.	0.000	0.6714	$(NH_4)_2SO_4$
25.	0.1259	0.0601	»	61.	0 0249	0.7079	»+1.1.6
25.	0.1413	0.0572	»	61.	0.0396	0.5387	1.1.6
25.	0.1646	0.0534	»+$CuSO_4.5H_2O$	61.	0.1631	0.1695	»
25.	0.1558	0.0293	$CuSO_4.5H_2O$	61.	0.2753	0.0998	»+$CuSO_4.5H_2O$
25.	0.1494	0.0158	»	61.	0.2419	0.000	$CuSO_4.5H_2O$
25.	0.1470	0.0096	»		1.1.6 = $(NH_4)_2SO_4.CuSO_4 6H_2O$		

For data on the solubility of mixed crystals of ammonium copper sulfate and other double salts see pages 1185 and 1186.

Data for equilibrium in the quarternary system $(NH_4)_2SO_4+CuSO_4+K_2SO_4+H_2O$ at 25° are given by Hayami, 1921.

Data for equilibrium in the quaternary system $(NH_4)_2SO_4+LiSO_4+H_2SO_4+H_2O$ at 30° are given by Van Dorp, 1923.

Equilibrium in the System Ammonium Sulfate + Magnesium Sulfate + Water.

(Weston, 1922.)

t°.	Gms. per 100 gms. sat. sol. $MgSO_4$.	Gms. per 100 gms. sat. sol. $(NH_4)_2SO_4$.	Solid Phase.	t°.	Gms. per 100 gms. sat. sol. $MgSO_4$.	Gms. per 100 gms. sat. sol. $(NH_4)_2SO_4$.	Solid Phase.
30.	0.00	43.60	$(NH_4)_2SO_4$	60.	0.0	46.8	$(NH_4)_2SO_4$
30.	0.30	41.20	$(NH_4)_2SO_4.MgSO_4.6H_2O$	60.	4.68	26.77	$(NH_4)_2SO_4.MgSO_4.6H_2O$
30.	1.25	26.15	»	60.	11.92	14.27	»
30.	7.30	10.55	»	60.	15.04	11 91	»
30.	16.53	6.31	»	60.	26.85	5.85	»
30.	27.60	2.98	»	60.	31.10	3.98	»

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Equilibrium in the System Ammonium Sulfate + Potassium Sulfate + Water. (Weston, 1922.)

Results at 25°.				Results at 30°.			
Gms. per 100 gms. sat. sol.		Gms. per 100 gms. Solid Phase.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. Solid Phase.	
K_2SO_4.	$(NH_4)_2SO_4$.	K_2SO_4.	$(NH_4)_2SO_4$.	K_2SO_4.	$(NH_4)_2SO_4$.	K_2SO_4.	$(NH_4)_2SO_4$.
0.0	43.5	0.0	100	0.0	44.2	0.0	100.0
1.83	40.9	12.0	86	1.2	42.7	3.3	96.7
3.09	38.6	28	72	2.4	40.9	12.2	87.8
4.00	37.0	40	60	4.1	37.8	28.7	71.3
4.40	35.1	53	47	5.9	33.5	43.6	56.4
5.42	31.4	69	31	6.4	31.0	61.3	38.7
7.35	22.3	84	16	9.1	18.5	74.2	25.8
9.52	10.7	94	6	10.7	8.4	98.2	1.8
10.70	0.0	100	0	11.2	0.0	100.0	0.0

The solid phase at both temperatures consists of a continuous series of mixed crystals. The author also gives complete data for the quarternary system $(NH_4)_2SO_4 + MgSO_4 + K_2SO_4 + H_2O$. The results are expressed in terms of the H_2O required for the solution of 100 gm. quantities of various mixtures of the three salts.

Equilibrium in the System Ammonium Sulfate + Sodium Sulfate + Water.

(This system has been studied in great detail by Dawson, 1918; Matignon and Meyer, 1917-1918 and Levi, 1924. Results at selected temperatures are given by Nishizawa, 1920; Fedotieff and Kolossoff, 1923; Sborgi et. at ,1924; and Freeth, 1924. Levi presents a diagram constructed from all available determinations and his results agree in general with the curves obtained. The following table is taken from the paper of Dawson.)

$1.1.4 = (NH_4)_2SO_4.Na_2SO_4.4H_2O$.

	Gms. per 100 gms. H_2O.		Mols. per 1000 mols. H_2O.		
t°.	Na_2SO_4.	$(NH_4)_2SO_4$.	Na_2SO_4.	$(NH_4)_2SO_4$.	Solid Phase.
−19.5 (Eutec.).	5.29	63.5	6.70	86.6	Ice+$Na_2SO_4.10H_2O$+$(NH_4)_2SO_4$
−18.....	5.40	63.5	6.85	86.6	$Na_2SO_4.10H_2O$+$(NH_4)_2SO_4$
−16.....	5.32	63.6	6.75	86.8	» » +1.1.4
−13.....	5.68	64.9	7.20	88.5	$(NH_4)_2SO_4$+1.1.4
−10.....	6.33	65.6	8.03	89.2	» »
0.....	7.81	66.7	9.9	91.0	» »
+15.....	10.85	69.6	13.75	94.9	» »
25.....	14.6	71.0	18.5	96.8	» »
40.....	19.7	75.1	25.0	102.4	» »
50.....	25.8	76.1	32.7	103.8	» »
−13.....	6.52	58.6	8.26	79.9	$Na_2SO_4.10H_2O$+1.1.4
−10.....	7.78	56.1	9.86	76.5	» »
0.....	12.05	46.6	15.25	63.5	» »
+15.....	22.9	33.3	29.0	45.4	» »
20.....	31.5	28.9	39.9	39.4	» »
25.....	40.9	22.1	51.8	30.2	» »
26.5.....	45.2	21.0	57.3	28.6	» » +Na_2SO_4
35.0.....	41.7	28.7	52.9	39.2	Na_2SO_4+1.1.4
40.....	40.5	34.7	51.3	47.3	» »
50.....	37.2	50.5	47.2	68.9	» »
55.....	36.0	62.0	45.6	84.6	» »
25.....	32.9	30.5	41.6	41.6	1.1.4
35.....	37.3	34.7	47.3	47.3	»
54.3.....	34.3	77.7	43.5	106.0	1.1.4+Na_2SO_4+$(NH_4)_2SO_4$
75.....	36.1	84.3	45 7	115.0	Na_2SO_4+$(NH_4)_2SO_4$
100.....	37.9	95.0	48.0	129.5	» »

Solubility of Ammonium Sulfate in Aqueous Solutions of Sodium Sulfate and Vice Versa.

(Results of 15° and at 35° by Fedotieff and Kolossof, 1923; at 25° and 60° by Freeth, 1924.)

Results at 15°.

d of sat. sol.	Gms. per 100 gms. H_2O. Na_2SO_4.	$(NH_4)_2SO_4$.	Solid Phase.
1.245	0.0	73.49	$(NH_4)_2SO_4$
1.253	2.86	73.13	»
1.259	3.95	72.80	»
1.261	5.26	72.17	»
1.272	7.79	71.06	»
1.286	12.77	69.70	» + 1.1.4
1.280	14.05	65.01	1.1.4
1.276	16.46	54.60	»
1.276	18.57	48.98	»
1.276	21.24	42.29	»
1.278	22.87	36.92	»
1.279	24.47	34.28	»
1.280	25.44	33.89	»
1.286	26.29	32.79	» + $Na_2SO_4.10H_2O$
1.265	22.91	30.95	$Na_2SO_4.10H_2O$
1.187	18.02	11.98	»
1.111	13.26	0.00	»

Results at 35°.

d of sat. sol.	Gms. per 100 gms. H_2O. Na_2SO_4.	$(NH_4)_2SO_4$.	Solid Phase.
1.250	0.0	80.74	$(NH_4)_2SO_4$
1.272	6.98	78.30	»
1.306	13.80	77.05	»
1.307	18.67	74.10	»
1.308	20.13	73.22	» + 1.1.4
1.305	23.63	56.11	1.1.4
1.312	27.14	48.59	»
1.313	28.84	44.91	»
1.314	30.46	42.43	»
1.328	36.61	35.12	»
1.338	39.18	32.15	»
1.344	42.13	30.75	» + Na_2SO_4
1.342	43.35	26.64	Na_2SO_4
1.340	45.16	19.61	»
1.333	46.01	14.27	»
1.327	47.64	6.91	»
1.325	49.53	0.00	»

Results at 25°.

Gms. per 100 gms. sat. sol. Na_2SO_4.	$(NH_4)_2SO_4$.	Solid Phase
3.35	41.23	$(NH_4)_2SO_4$
6.65	39.16	»
8.00	38.70	» + 1.1.4
14.12	27.42	1.1.4
23.90	15.8	»
25.76	14.1	» + $Na_2SO_4.10H_2O$
24.5	12.5	$Na_2SO_4.10H_2O$
21.78	7.4	»

Results at 60°.

Gms. per 100 gms. sat. sol. Na_2SO_4.	$(NH_4)_2SO_4$.	Solid Phase.
0.0	46.80	$(NH_4)_2SO_4$
10.70	40.30	»
16.33	36.91	» + Na_2SO_4
18.70	29.48	Na_2SO_4
26.94	9.70	»
31.20	0.00	»

1.1.4 = $(NH_4)_2SO_4.Na_2SO_4.4H_2O$

Freeth also gives complete data for the quaternary equilibrium in the system: $(NH_4)_2SO_4 + NH_4ClO_4 + Na_2SO_4 + NaClO_4 + H_2O$ at 25° and at 60°.

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given for mixtures of ammonium sulfate and sulfuric acid by Kendall and Landon, 1920 and Cambi and Bozza, 1923.

AMMONIUM Gallium **SULFATE** Alum $NH_4Ga(SO_4)_2.12H_2O$.

100 cc. sat. solution in water contain 30.84 gms. $NH_4Ga(SO_4)_2.12H_2O$ at 25°.
» » » » 50% alcohol » 0.0217 » » »
» » » » 70% » » 0.00875 » » »
» » » » a mixt. of 35 cc. of H_2O + 50 cc. of C_2H_5OH + 15 cc. conc. H_2SO_4 contain 0.1613 gms. $NH_4Ga(SO_4)_2.12H_2O$ at 25°. (Dennis and Bridgman, 1918.)

AMMONIUM N-Phenyl β Aminoethyl Hydrogen Sulfate $C_6H_5NH.C_2H_4.O.SO_3.NH_4$ (m. pt. 132°)

100 cc. sat. solution in water contain 70 gms. of the salt at 15°. (Saunders, 1922.)

AMMONIUM 10-Chlorophenanthrene 3 or 6 Sulfonate $C_{14}H_8Cl.SO_3NH_4.H_2O$.

100 gms. H_2O dissolve 0.442 gms. of the anhydrous salt at about 20°. (Sandqvist, 1917.)

AMMONIUM Naphthylamine Disulfonates 2.6.8 and 2.5.7, $C_{10}H_5(NH_2)(SO_3NH_4)_2$.

100 gms. sat. solution in water contain 70.35 gms. of the 2.6.8 salt at 15°.
» » » » » 68.1 » » 2.5.7 » »
(Braunschweig, 1922, 1926.)

AMMONIUM THIOCYANATE NH_4CNS.

Freezing-point lowering data (solubilities, see foot-note, p. 1001) for mixtures of ammonium thiocyanate and water are given by Vasiliev, 1917.

SOLUBILITY OF AMMONIUM THIOCYANATE IN AQUEOUS SOLUTIONS OF AMMONIA (Foote, 1921.)

$t°=10°$. Gms. per 100 gms. sat. sol.		$t°=20°$. Gms. per 100 gms. sat. sol.		$t°=30°$. Gms. per 100 gms. sat. sol.		Solid Phase
NH_3.	NH_4CNS.	NH_3.	NH_4CNS.	NH_3.	NH_4CNS.	in all cases.
0.0	58.23	0.0	62.54	0.0	66.26	NH_4CNS
3 49	59.40	3.53	63.57	2.85	67.28	»
6.86	61.03	6.23	64 99	5.79	68.30	»
9.22	62.61	8.57	66.20	8.38	69.48	»
12.33	65.29	11.19	67.57	12.18	71.84	»
14.53	66.67	12.54	69.06	14.46	74.00	»
17.12	69.50	15.65	71.89	17.04	76.63	»
19.78	72.84	18.07	74 15	20.01	79.99	»
22.70	77.30	21.35	78.65			

Freezing-point lowering data (solubilities, see foot-note, p. 1001) for mixtures of ammonium thiocyanate and thiourea are given by Kettner, 1919.

AMMONIUM DITHIONATE $(NH_4)_2S_2O_6.{}^1/_2H_2O$.

SOLUBILITY IN WATER. (de Baat, 1926.)

$t°$.	Gms. $(NH_4)_2S_2O_6$ per 100 gms. sat. sol.	Solid Phase.	$t°$.	Gms. $(NH_4)_2S_2O_6$ per 100 gms. sat. sol.	Solid Phase.
0..	57.05	$(NH_4)_2S_2O_6.{}^1/_2H_2O$	20..	62,43	$(NH_4)_2S_2O_6.{}^1/_2H_2O$
10..	60.14	»	30..	64.10	»

SOLUBILITY OF AMMONIUM DITHIONATE IN AQUEOUS SOLUTIONS OF BARIUM DITHIONATE AT 30° AND VICE VERSA. (de Baat, 1296.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
BaS_2O_6.	$(NH_4)_2S_2O_6$.	Solid Phase.	BaS_2O_6.	$(NH_4)_2S_2O_6$.	Solid Phase.
0.0	64.60	$(NH_4)_2S_2O_6.{}^1/_2H_2O$	6.92	40.15	not stated
0.35	58.64	not stated	8.31	37.90	»
0 62	56.26	»	10.26	37.26	»
1.05	53.81	»	11.21	33.62	»
2,75	48.45	»	17.20	11.0	»
5.28	43.22	»	19.76	0.0	$BaS_2O_6.2H_2O$

SOLUBILITY OF AMMONIUM DITHIONATE IN AQUEOUS SOLUTIONS OF COPPER DITHIONATE AT 30° AND VICE VERSA. (de Baat, 1926.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
CuS_2O_6.	$(NH_4)_2S_2O_6$.	Solid Phase.	CuS_2O_6.	$(NH_4)_2S_2O_6$.	Solid Phase.
10.45	52.62	$(NH_4)_2S_2O_6.{}^1/_2H_2O$	36.19	18.39	$D_s+CuS_2O_6.4H_2O$
24.17	38.30	» + D_s	37.26	16.16	$CuS_2O_6.4H_2O$
29.70	29.28	D_s	41.06	8.91	»
36.04	18.50	»	45.51	0.00	»

D_s = Double salt, the composition of which is not stated.

SOLUBILITY OF AMMONIUM DITHIONATE IN AQUEOUS SOLUTIONS OF STRONTIUM DITHIONATE AT 30° AND VICE VERSA. (de Baat, 1926.)

Gms. per 100 gms. sat sol.			Gms. per 100 gms. sat. sol.		
SrS_2O_6.	$(NH_4)_2S_2O_6$.	Solid Phase.	SrS_2O_6.	$(NH_4)_2S_2O_6$.	Solid Phase.
0.98	63.73	$(NH_4)_2S_2O_6.{}^1/_2H_2O$	6.47	34.57	$SrS_2O_6.4H_2O$
2.17	60.66	» + $SrS_2O_6.4H_2O$	8.79	24.52	»
2.71	56.76	$SrS_2O_6.4H_2O$	10.73	16.55	»
4.45	45.04	»	14.90	0.0	»

AMMONIUM MetaVANADATE NH_4VO_3.

Solubility in Water. (Lachartre, 1924.)

t°.	Gms. NH_4VO_3 per 100 gms. sat. sol.	t°.	Gms. NH_4VO_3 per 100 gms. sat. sol.
15.....	5.18	70.....	36.0
32.....	10.4	96.....	65.0
50.....	16.1		

At temperatures above 50° the results are not exact on account of the decomposition of the vanadate with loss of ammonia.

AMMONIUM BiVANADATE $(NH_4)_2O(V_2O_5).3H_2O$.

100 gms. sat. solution in water contain 28.0 gms. $(NH_4)_2O(V_2O_5)_2$ at 16°.
(Lachartre, 1924.)

Note. — The above results by Lachartre, are about ten times too high as compared with previous determinations. The decimal points should probably be moved one place to the left.

IsoAMYL ALCOHOL $(CH_3)_2CH.(CH_2)_2OH$.

Reciprocal Solubility of Isoamyl Alcohol and Water.
(Kablukov and Malischeva, 1925.)

A volumetric method, apparently identical with that described by Hill, 1923, was used. The method of calculation eliminates the correction for change of volume on mixing and permits direct estimation from the volumetric results.

Solubility of Isoamyl Alcohol in Water.

t°.	d of H_2O layer.	Gms. Alcohol per 100 gms. H_2O layer. K and M.	Fontein, 1923.
15..	0.9929	3.04	2.72
20..	0.9924	2.82	–
25..	0.9914	2.67	–
30..	0.9904	2.56	2.31 (29°)

Solubility of Water in Isoamyl Alcohol.

t°.	d of Alcohol layer.	Gms. H_2O per 100 gms. Alcohol layer. K and M.	Fontein, 1923.
15..	0 8306	9.33	9.31 (15° 5)
20..	0.8275	9.60	–
25..	0.8242	9.87	–
30..	0.8209	10.15	10.18 (34°)

The determinations quoted from Fontein were made by the « turbidity point » method. A small scale diagram, without numerical results, is given for the above system by Brun, 1925.

Solubilities of Isoamyl Compounds in Water. (Führer, 1924.)

Compound.	Formula.	d of cmpd.	t°.	Gms. Cmpd. per 100 gms. sat. sol.
Isoamyl alcohol.....	$(CH_3)_2CH.(CH_2)_2OH$	0.81	18	2.75
Isoamyl bromide.....	$(CH_3)_2CH.(CH_2)_2Br$	1.17	16.5	0.02
Isoamyl urethan.....		–	15.5	0.48

Mutual Solubility of Isoamyl Alcohol and Glycerol. (Mc Ewen, 1923.)

t°.	Gms. Alcohol per 100 gms. sat. sol.	t°.	Gms. Alcohol per 100 gms. sat. sol.	t°.	Gms. Alcohol per 100 gms. sat. sol.
21.5.....	5.05	73.7.....	27.62	54.41.....	69.3
58.0.....	10.35	74.2*.....	31.90	61.4.....	62.4
66.5.....	13.97	74.1*.....	36.79	36.8.....	76.21
71.5.....	19.20	73.0.....	46.16	12.5.....	84.26

* Temperature of critical opalescence.

AMYL AMINES $n\,CH_3(CH_2)_4.NH_2$ and Iso $(CH_3)_2CH.CH_2CH_2NH_2$.

Distribution of Each between Water and Xylene at 25°. (Smith, 1921-1922.)

Results for *n* Amylamine. Millimols. $CH_3(CH_2)_4.NH_2$ per liter of			Results for Isoamylamine. Millimols. $(CH_3)_2CH.(CH_2)_2NH_2$ per liter of		
H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.
0.755	1.15	1.52	0.525	0.650	1.24
1.335	2.67	2.00	0.55	0.700	1.28
1.875	4.275	2.28	0.75	1.073	1.43
2.655	7.17	2.70	1.00	1.50	1.50
5.08	14.92	2.94	2.65	5.10	1.92

DISTRIBUTION OF : (Smith, 1921-1922.)

n Amyl Amine between Water and Chloroform at 25°.

Millimols. $CH_3(CH_2)_4.NH_2$ per liter of		$\frac{C_2}{C_1}$.
Water layer (C_1).	$CHCl_3$ layer (C_2).	
0.1168	0.6832	5.86
0.150	1.20	8.0
0.1735	1.70	9.8
0.200	2.30	11.5

Isoamyl Amine between Water and Ether at 25°.

Millimols. $(CH_3)_2CH(CH_2)_2.NH_2$ per liter of		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	Ether layer (C_2).	
0.2375	0.3875	1.63
0.3750	0.6500	1.73
0.4875	1.0125	2.08
0.8375	1.8375	2.19

DISTRIBUTION OF DIISO AMYL AMINE ACID PHTHALATE BETWEEN ACETONE AND GLYCEROL AT 25°.

(Smith, 1921-1922.) (See Note. p. 1301.)

Millimols. Di isoamylamine Acid Phthalate per liter of		$\frac{(A)}{(G)}$.
Glycerol layer (G).	Acetone layer (A).	
1.9375	1.750	0.905
3.075	2.725	0.886
4.875	3.625	0.744
6.30	4.80	0.762
7.85	6.15	0.783

Tri**AMYLOSE** $[C_6H_{10}O_5]_3.4H_2O$, β Hexa**AMYLOSE** $[C_6H_{10}O_5]_6.9H_2O$.

SOLUBILITY OF EACH IN WATER.

(Pringsheim and Dernikos, 1922.)

The compounds were each dissolved in water by warming and the solutions allowed to stand at 20° untill completely crystallized.

100 gms. of the sat. solution of Tri amylose contain 1.39 gms. of the anhydrous compound.

100 gms. of the sat. solution β-Hexa amylose contain 2.40 gms. of the anhydrous compound.

The accuracy of the above results is questioned by Karrer, 1922, who found no difference in the solubility when the finely powdered compounds were shaken with water at the same temperature.

ANILINE $C_6H_5(NH_2)$.

NOTE. — In the table of results by Sidgwick, Pickford and Wilsden given on page 73 of the preceding volume of this compilation (1919), the heading of the 3rd and 6th columns should be changed to Gms. H_2O per 100 gms. Aniline Layer.

RECIPROCAL SOLUBILITY OF ANILINE AND WATER DETERMINED BY THE FREEZING-POINT METHOD.

(Average curve from the results of Hill and Macy, 1924, and Appleby and Davies, 1925.)

t°.	Gms. $C_6H_5NH_2$ per 100 gms. sat. sol.	Solid Phase.
—0.1.....	0.5	Ice
—0.2.....	1.0	»
—0.3.....	1.55	»
—0.4.....	2.07	»
—0.5.....	2.6	»
—0.66.....	3.5	» (quad. pt.)
congruent solutions here		
—0.66.....	95.4	» (quad. pt.)
—3.0.....	95.7	»
—5.0.....	96.0	»
— 7.0.....	96.32	Ice
— 9.0.....	96.7	»
—11.0.....	97.05	»
—11.9 (Eutec.).	97.25	» + $C_6H_5NH_2$
—11.0.....	97.85	$C_6H_5NH_2$
—10.0.....	98.4	»
— 9.0.....	98.9	»
— 8.0.....	99.35	»
— 7.0.....	99.7	»
— 6.0.....	100.0	»

Using an optical method, Chéneveau (1922) found that 100 gms. of H_2O dissolve 3.73 gms. aniline at 16° and 100 gms. aniline dissolve 4.68 gms. H_2O at 15°.

Solubility of Water in Aniline, Determined by the Synthetic Method.

(Appleby and Davies, 1925.)

t°.	Gms. H_2O per 100 gms. sat. sol.	t°.	Gms. H_2O per 100 gms. sat. sol.	t°.	Gms. H_2O per 100 gms. sat. sol.
15.9.....	4.534	20.5.....	4.815	34.1.....	5.398
18.3.....	4.659	21.15....	4.926	43.5.....	5.899
20.0.....	4 835	22.6.....	4.950	47.5.....	6.104

Solubility of Aniline in Aqueous Solutions of Acetic Acid.

(Angelescu and Motzoc, 1925.)

The determinations were made by adding aniline drop by drop to water or aqueous acetic acid just to the appearance of clouding at a definite temperature. The quantities of the three constituents were determined by careful weighings.

Results at 0°. Gms. per 100 gms. sat. sol.			Results at 20°. Gms. per 100 gms. sat. sol.		
$C_6H_5NH_2$.	CH_3COOH.	H_2O.	$C_6H_5NH_2$.	CH_3COOH.	H_2O.
3.68	0.00	96.32	3.59	0.00	96.41
7.13	2.89	89.98	4.14	0.35	95.51
10.00	5.91	84.09	5.30	1.41	93.29
13.59	9.74	76.67	7.58	3 87	88.55
17.10	12.41	70.49	11.05	8.08	80.87
20.82	14.02	65.16	15.73	12.16	72.11
26.76	15.33	57.88	22.26	14.86	62.88
30.10	15.73	54.17	26.56	15.67	57.72
32.17	15.88	51.95	30.80	16.18	53.02
34.75	16.01	49.24	34.03	16.40	49.57
37.76	16.16	46.08	43.91	16.59	39.50
38.72	16.20	45.08	58.64	16.39	24.97
47.68	16.26	36.06	63.76	15.63	20.61
58.15	15.60	26.25	67.90	14.33	17.77
68.92	13.38	17.70	76.68	10.73	12.59
76.83	10.68	12.49	81.43	8.69	9.88
83.36	6 23	7.41	86 58	5.94	7.48
90.37	4.02	5.61	91.18	3.07	5.75
95.71	0.00	4.29	94.84	0.00	5.16

In order to determine which of the above mixtures represent the upper and lower layers in contact with each other, a series of determinations of the distribution of acetic acid between water and aniline was needed. The results of these determinations at 20°, are as follows :

Gms. CH_3COOH per 100 gms.			Gms. CH_3COOH per 100 gms.		
H_2O layer (C_1).	$C_6H_5NH_2$ layer (C_2).	$\frac{C_1}{C_2}$.	H_2O layer (C_1).	$C_6H_5NH_2$ layer (C_2).	$\frac{C_1}{C_2}$.
1.68	0.65	2.58	6.82	4.33	1.57
2.15	0.92	2.33	8.77	6.22	1.41
3.05	1.51	2.02	9.63	7.25	1.33
4.65	2.56	1.82	11.19	9.30	1.20
5.22	3.11	1.68			

The authors next determined the temperatures at which two layers are formed in solutions containing constant concentrations of acetic acid and variable percentages of water and aniline. For this purpose mixtures of aniline and acetic acid and of water and acetic acid, containing in both cases the same weight per cent of acetic acid, were prepared. Variable mixtures of these two solutions yield in every case a ternary mixture containing a constant concentration of acetic acid. On gradually changing the temperature of such ternary mixtures, containing respectively 15.83, 16.25 and 16.56 per cent of $CH_3CO\,OH$, an upper and a lower point was found at which clouding occurs. Thus for these ranges of concentration the systems yield closed curves of solubility having an upper and a lower critical temperature of solution.

VARIATION OF THE TEMPERATURE OF SOLUTION IN TERNARY MIXTURES CONTAINING :

15.83 % $CH_3CO OH$.			16.25 % $CH_3CO OH$.			16.56 % $CH_3CO OH$.		
Gms. $C_6H_5NH_2$ per 100 gms. mixture.	Lower temp.	Upper temp.	Gms. $C_6H_5NH_2$ per 100 gms. mixture.	Lower temp.	Upper temp.	Gms. $C_6H_5NH_2$ per 100 gms. mixture.	Lower temp.	Upper temp.
56.60	+ 2.0	35.6	51.88	10.4	34.9	47.25	22.7	29.0
55.40	— 10.3	43.0	49.88	3.8	42.2	46.52	20.5	33.5
54.22	not. det.	47.5	47.89	0.4	46.4	45.42	18.8	36.1
52.32	»	52.0	45.46	0 2	49.8	44.10	18.0	38.8
51.0	»	54.6	42.71	1.0	52.8	42.79	17.7	40.6
49.34	»	57.6	39 91	3.7	54.5	41.30	18.1	42.3
47.25	»	60.2	36.95	7.4	55.5	39.82	19.4	43.0
45.67	»	62.0	35.43	9.9	55.5	38.53	20.5	43.1
43.85	»	63.2	34.61	11.5	55.3	37.14	22.7	43.0
41.98	»	64.2	33.94	12.7	54.7	35.87	25.2	42.7
40.31	»	65.1	33.38	13.9	54.2	35.02	27.6	41.1
38.77	»	65.0	32.76	15.5	53.7	34.32	30.3	39.3
37.53	»	65.1	32.15	17.2	53.0	33.43	33.6	—
36.33	»	65.4	31.49	19.3	51.8			
35.14	— 8.6	65.3	30.85	22.0	49.9			
33.81	— 5.3	65.2	30.27	25.0	47.9			
32.87	— 2.8	64.9	29.97	26.8	46.3			
31.81	+ 0.2	64.2	29.66	29.4	44 3			
30.82	3.3	63.3	29.43	31.9	41.8			
29.51	8.0	61.4						
28.38	12.8	58.7						
27.74	16.1	56.4						
27.37	18.2	55.6						
26.85	21.7	52.7						
26.42	25.3	50.0						
26.06	29.1	46.6						
25.84	32.6	43.6						
25.73	35.7	40.0						

With mixtures containing 16.75 % $CH_3CO OH$ two layers were not formed but an intense opalescence between 25° and 30° was observed.

SOLUBILITY OF ANILINE IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL, AND OF MIXTURES OF ETHYL ALCOHOL AND NITROBENZENE.

(Rossett, Murange and Vinter, 1923.)

t° of clouding.....	26.5.	22.5.	14.5.	8.0.	2.5.
In mixtures composed of 10 gms. $C_6H_5NH_2$ + 5 cc. of Aq. C_2H_5OH of :	57.5 %	58.3 %	59.3 %	61.2 %	62.8 %

t° of clouding.	In 5 cc. Aq. 59.3 % C_2H_5OH + 10 cc. of a mixture of $C_6H_5NH_2 + C_6H_5NO_2$ containing.		t° of clouding.	In 5 cc. Aq. 59.3 % C_2H_5OH + 10 cc. of a mixture of $C_6H_5NH_2 + C_6H_5NO_2$ containing :	
14.5.....	0.0	% $C_6H_5NO_2$	24.5.....	5.84	% $C_6H_5NO_2$
16.0.....	1.005	»	34.0.....	11.54	»
20.00.....	3.26	»	43.5.....	17.22	»

t° of clouding.	In 5 cc. Aq. 68.2 % C_2H_5OH + 10 cc. of a mixture of $C_6H_5NH_2 + C_6H_5NO_2$ containing :		t° of clouding.	In 5 cc. Aq. 80 % C_2H_5OH + 10 cc. of a mixture of $C_6H_5NH_2 + C_6H_5NO_2$ containing :		t° of clouding.	In 5 cc. Aq. 89 % C_2H_5OH + 10 cc. of a mixture of $C_6H_5NH_2 + C_6H_5NO_2$ containing :	
14.0...	22.89	% $C_6H_5NO_2$	19...	78.13	% $C_6H_5NO_2$	6.0...	91.49	% $C_6H_5NO_2$
21.0...	28.16	»	26...	82.13	»	10.5...	95.57	»
29.....	87.43	»	88...	87.43	»	13.5...	98.27	»
						16.0...	100.00	»

Solubility of Aniline in Aqueous Solutions of Lactic Acid.

(Angelesco, 1925.)

The determinations were made by adding aniline drop by drop to water or aqueous lactic acid just to the appearance of clouding at a definite temperature. The quantities of the three constituents were determined by careful weighings.

Results at 0°.

Gms. per 100 gms. sat. solution.		
$C_6H_5NH_2$.	$CH_3.CHOH.COOH$.	H_2O.
3.68	0.00	96.32
5.43	1.91	92.66
7.86	4.34	87.80
9.78	6.25	83.97
11.89	8.19	79.92
14.57	10.40	75.03
17.00	11.74	71.26
21.23	12.96	65.81
27.94	13.68	58.38
34.07	13.72	52.21
40.56	13.48	45.96
48.19	12.97	38.84
52.07	12.60	35.33
56.27	12.05	31.68
60.97	11.28	27.75
65.82	10.32	23.86
72.60	8.65	18.75
78.84	6.83	14.33
85.14	4.62	10.24
91.95	1.93	6.12
95.71	0.00	4.29

Results at 20°.

Gms. per 100 gms. sat. solution.		
$C_6H_5NH_2$.	$CH_3.CHOH.COOH$.	H_2O.
3.59	0.00	96.41
6.73	2.96	90.31
8.85	5.02	86.13
10.99	7.14	81.87
14.07	9.52	76.41
17.59	11.42	70.99
21.96	12.65	65.39
29.45	13.39	57.16
42.76	13.02	44.22
45.59	12.82	41.59
48.40	12.52	39.06
50.79	12.35	36.86
53.31	11.84	32.85
60.16	11.14	28.70
66.18	10.02	23.80
71.36	8.99	19.65
76.70	7.31	15.99
81.90	5.66	12.44
86.53	3.91	9.55
92.24	1.61	6.15
94.84	0.00	5.16

In order to have complete information in regard to the isotherms the author also determined the distribution of lactic acid between water and aniline at 20°.

Gms. $CH_3CHOH.COOH$ per 100 gms.		
H_2O layer (C_1).	Aniline layer C_2.	$\frac{C_1}{C_2}$.
2.29	0.32	7.16
4.14	0.64	6.47
7.88	1.85	4.26
9.43	2.80	3.37

Gms. $CH_3CHOH.COOH$ per 100 gms.		
H_2O layer (C_1).	Aniline layer C_2.	$\frac{C_1}{C_2}$.
11.62	5.18	2.24
12.85	8.20	1.56
13.57	10.01	1.36
13.50	11.70	1.15

The critical concentration at 20° is approximately 13.3 per cent CH_2 CHOHCOOH.

The author also determined the temperatures of solution of different percentages of aniline in three concentrations of aqueous lactic acid. The following results were read from the curves obtained by plotting the author's determinations.

They Show the Solubility of Aniline in :

Aq. Lactic Acid of 13.27 % conc.

t°	Gms. $C_6H_5NH_2$ per 100 gms. lower layer.	upper layer.
—7...	25.2	39.5
—5...	26.1	38.0
—3...	27.2	36.2
—1...	28.4	34.5
0...	29.4	33.5
+1...	30.7	32.0
1.1 (crit. temp.)	31.6	

Aq. Lactic Acid of 13.5 % conc.

t°.	Gms. $C_6H_5NH_2$ per 100 gms. lower layer.	upper layer.
—7...	22.3	45.3
0...	24.1	41.7
+5...	25.4	39.6
10...	26.8	37.8
15...	28.2	36.3
20...	30.0	34.9
23 (crit. t.)..	32.4	

Aq. Lactic Acid of 13.8 % conc.

t°.	Gms. $C_6H_5NH_2$ per 100 gms. lower layer.	upper layer.
— 7...	20.9	49.0
0...	22 2	45.1
10...	24.2	42.1
20...	26.1	39.9
30...	28.0	38.2
40...	30.5	36.0
43.4 (crit. t.).	33.0	

Solubility of Aniline in Aqueous Solutions of Salts at 18°.

(von Euler ah Svanberg, 1917, 1917*a*, 1926.)

Aqueous solvent.	Gms. $C_6H_5NH_2$ per 100 cc. sat. sol.	Aqueous solvent.	Gms. $C_6H_5NH_2$ per 100 cc. sat. sol.
Water	3.61	1.0 normal Na salicylate	7.14
1.0 normal NaCl	2.55	2.0 » K valerate	3.37
1.0 » Na acetate	2.32	2.0 » K isovalerate	3.37
1.0 » Na butyrate	2.53	0.5 » Aniline chloride	4.60
1.0 » Na isovalerate	1.88	1.0 » » »	5.30
1.0 » Na benzoate	3.80	0.5 » Aniline nitrate	4.60
1.0 » NH_4 benzoate	4.60	1.0 » » »	5.25

Solubility of Mixtures of Aniline, Oils and Water. (Jansen and Schut, 1923.)

The authors determined the temperature of clouding in mixtures composed of 4 parts of aniline (containing increasing percentages of H_2O) and one part of oil.

Results for Rape Oil.		Results for Soya, Peanut and Corn Oil.			
			t° of clouding with		
Per cent of H_2O in aniline.	t° of clouding.	Per cent of H_2O in aniline.	Soya Oil.	Peanut Oil.	Corn Oil.
0.0	37.6	0.0	8.7	26.2	11.0
1.16	44.6	1.01	13.6	31.6	15.5
2.07	50.4	1.98	18.6	37.3	20.4
3.11	57.3	3.01	24.3	43.5	25.6
4.22	64.5	4.07	30.6	50.3	31.6
4.87	69.3	4.71	34.0	54.1	35.0

Distribution of Aniline and of Methyl Aniline between Water and Xylene at 25°. (Smith, 1921-1922.)

Millimols. $C_6H_5NH_2$ per liter of			Millimols. $C_6H_4(CH_3)NH_2$ per liter of		
H_2O layer (C_1).	Xylene layer (C_2).	$\frac{(C_2)}{(C_1)}$.	H_2O layer (C_1).	Xylene layer (C_2).	$\frac{(C_2)}{(C_1)}$.
0.150	0.45	2.9	0.125	1.31	10.5
0.203	0.67	3.3	0.185	2.10	10.9
0.279	1.20	4.3	0.300	3.40	11.3
0.378	2.00	5.3			

Critical Solution Temperatures of Aniline, in Various Solvents. (Thiry, 1925.)

Solvent.	Constants of the solvent. f. pt.	b. pt.	$d_4^{t_1}$.	Mol. wt.	Solubility results. Critical solution temp.	Per cent conc. $C_6H_5NH_2$ at C. S. t.
Cyclopentane	− 94.8	49.37 (49.5)	0.7505 (0.750)	70.08	16.8 (18°)	37.5
Methyl cyclopentane	−141.0	71.9 (72.0)	0.7528 (0.7533)	84.1	35.2 (35)	30.0
Ethyl »	−137.9	103.0	0.7710	98.11	39.8	35.0
Propyl »	−120.3	131.4	0.7813	112.13	45.5	40.0
Butyl »	−108.2	156.8	0.7887	126.15	51.1	42.5
Cyclohexane	+ 6.55	80.77 (80.8)	0.7830 (d_4^{20} 0.7967)	84.036	30.8 (31.0)	40.0
Methyl cyclohexane	−147.5	100.5 (100.4)	0.7693 (d_4^{25} 0.798)	98.112	41.0 (41.0)	40.0
Hexane	− 94.65	69.0 (69.0)	0.6780 (0.6638)	86.112	69.2 (69.0)	41.0
Methyl 3 pentane	—	63.2	0.6687	—	69.6	41.5
Isohexane	−137.1	60.18 (61.7-62.4)	0.6580 (0.658)	—	74.9 (73.8)	37.5
Trimethylethylmethane	− 98.2	19.70	0.6538	—	80.65	40.0

The results given in parentheses in the above table are those of Chavanne and Simon, 1919 and 1920. These authors also give for mixtures containing aniline the following additional critical solution temperatures. Isopentane (b. p. 27°-29°; $d_4^{t_1} = 0.6394$) 77°; Pentane (b. p. 35°.8-36°.3; $d_4^{t_1}$ 0.6454) 72°; Isoheptane (b. p. 90-91°; $d_{15}^{t_1} = 0.6842$) 72°.8; Heptane (b. pt. 98°-98°.3; $d_{15} = 0.6879$) 70°; Isooctane (b. p. 116°) 74°; Octane (b. p. 125.8°; $d_{15} = 0.7063$) 72°; Dimethylcyclopentane (b. p. 91°-94°) 45°; Dimethylcyclohexane (b. pt. 121.2°-121.8°; $d_{15} = 0.775$) 49°.

Van Rysselberge, gives 42° as the C. S. T. of Aniline + Dimethyl 1.2 Cyclopentane.

MUTUAL SOLUBILITY OF ANILINE AND CYCLOHEXANE. (Buchner and Kleyn, 1924.)

Saturation temp.	18°.3.	29°.8.	31°.2.	31°.3.	31°.3.	30°.3.	29°.4.	24°.6.	23°.6.
Gms. $C_6H_5NH_2$ per 100 gms. sat. sol...	11.5	19.3	26.8	40.0	57.2	64.9	68.0	75.0	76.0

RECIPROCAL SOLUBILITY OF ANILINE AND HYDROCARBONS. (Tizard and Marshall, 1921.)

The authors desired a method for the determination of aromatic hydrocarbons in certain mixtures. For this purpose they made a long series of experiments showing the effect of the addition of various aromatic hydrocarbons, upon the temperature of clouding of mixtures of equal volumes of aniline and a sample of « petrol », free of aromatic hydrocarbons. The results are presented, for the most part, in the form of curves.

THE FREEZING-POINTS OF ANILINE CONTAINING SMALL AMOUNTS OF IMPURITIES. (Sanderson and Jones, 1920.)

Mixtures of pure dry aniline and the several compounds, each carefully purified and dried, were prepared and their freezing-points determined. The table shows the percentage by weight of aniline in the mixture and the corresponding freezing-point.

Wt. per cent of Aniline.	Freezing-point of the dry binary mixture of aniline with								
	Benzene.	Phenyl hydroxyl amine.	Nitroso benzene.	*p* Amino phenol.	Nitro benzene.	*o* Toluidine.	*p* Toluidine.	*m* Phenylene diamine.	Xylidine.
100	—6.00	—6.00	—6.00	—6.00	—6.00	— 6.00	—6.00	—6.00	—6.00
99	—7.18	—6.47	—6.58	—6.58	—6.53	— 6.60	—6.65	—6.60	—7.00
98	—8.00	—6.94	—7.16	—7.16	—7.03	— 7.18	—7.25	—7.18	—7.75
97	—8.70	—7.41	—7.74	—7.74	—7.50	— 7.75	—7.85	—7.75	—9.00
96	—9.30	–	–	–	—7.97	— 8.33	—8.45	–	–
95	–	–	–	–	—8.43	— 8.95	—9.05	–	–
94	–	–	–	–	—8.85	— 9.53	—9.63	–	–
93	–	–	–	–	—9.27	—10.11	–	–	–

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given for mixtures of aniline and each of the following compounds :

Benzene (Linard, 1925.)
Nitrobenzene (Linard, 1925.)
Benzoic acid (Kremann, Weber and Zechner, 1925.)
Crotonitrile (Lafortune, 1923.)
Vinylacetic nitrile (Lafortune, 1923.)
m Amino phenol (Kremann and Hohl, 1920.)
Triphenyl methane (Kremann, Odelga and Zawodeky, 1921.)
Mercuric acetate (Mameli and Cocconi, 1922.)
Guaiçol (Puschin and Vaic, 1926.)
α Naphtol (Kremann, Lupfer and Zawodsky, 1920.)
β Naphtol (Kremann, Lupfer and Zawodsky, 1920.)
Pyrogallol (Kremann and Zechner, 1918.)
Cyclohexane (Linard, 1925.)
m Toluidine (Linard, 1925.)
1.3.4 Dinitro Toluene (Kremann, Hönigsberg and Mauermann, 1923.)
1.3.5 Dinitro Toluene (Kremann, Hönigsberg and Mauermann, 1923.)

ANILINE HELIANTHATE $C_6H_5NH_2.C_{14}H_{15}N_3SO_3$; also Methyl and Dimethyl Aniline Helianthates.

1000 cc. H_2O dissolve 0.26 gm. Aniline Helianthate at 20°-25° (Stark and Dehn, 1918.)
1000 cc. » 0.54 gm. Methyl » » »
1000 cc. » 0.70 gm. Dimethyl » » »

ANILINE CHLOROSTANNATE $(C_6H_5NH_2)_2.H_2SnCl_6$.

100 cc. H_2O dissolve about 28.0 gms. aniline chlorostannate at 16° (Druce, 1918.)

p Brom**ANILINE** *o* Sulfonic Acid, *p* $BrC_6H_3(NH_2)$, *o* SO_3H.

SOLUBILITY IN WATER (Philip and Colborne, 1924.)

t°.	Gms. $BrC_6H_3(NH_2)SO_3H$ per 100 gms. sat. sol.	Solid Phase.
0.0...	0.223	$BrC_6H_3(NH_2)SO_3H$
8.35..	0.279	»
16.75..	0.359	»
25.0...	0.446	»
40.0...	0.650	»
55.0...	0.965	»
70.....	1.375	$BrC_6H_3(NH_2)SO_3H$
85.....	2.02	»
0.0...	0.259	$BrC_6H_3(NH_2)SO_3H.H_2O$
8.35..	0.352	» (unstable)
16.8...	0.473	» »
25.0...	0.606	» »

p BromANILINE *m* Sulfonic Acid, *p* $BrC_6H_3(NH_2)\,mSO_3H$.

Solubility in Water.
(Philip and Colborne, 1924.)

This compound exists in two enantiotropic forms. It also forms a labile monohydrate.

t°.	Gms. $BrC_6H_3(NH_2)SO_3H$ per 100 gms. sol. sat.	Solid Phase.	t°.	Gms. $BrC_6H_3(NH_2)SO_3H$ per 100 gms. sat. sol.	Solid Phase.
0.0...	0.726	$BrC_6H_3(NH_2)SO_3H$(rhombic)	0.0...	0.475	$BrC_6H_3(NH_2)SO_3H$ (monoclinic)
9.8...	0.885	» »	12.55..	0.645	» »
25.0...	1.198	» »	25.0...	0.862	» »
40.1...	1.610	» »	40.0...	1.215	» »
54.8...	2.10	» »	56.3...	1.790	» »
70.4...	2.81	» »	70.0...	2.44	» »
85.0...	3.66	» »	85.0...	3.35	» »

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given by Hertel, 1924, for :

o Brom aniline + Picric acid.
» » » + Trinitro benzene.
2.4 Dibrom aniline + Picric acid.

o, *m* and *p* ChlorANILINES, *o*, *m* and *p* $ClC_6H_4.NH_2$.

Solubility of Each in Water.
(Sidgwick and Rubie, 1921.)

See Note, p. 1004.

Ortho Chloraniline. t°.	Gms. *o* $ClC_6H_4NH_2$ per 100 gms. sat. sol.	Meta Chloraniline. t°.	Gms. *m* $ClC_6H_4NH_2$ per 100 gms. sat. sol.	Para Chloraniline. t°.	Gms. *p* $ClC_6H_4NH_2$ per 100 gms. sat. sol.
— 2.1....	100.0 *	—10.4....	100.0 *	70.5....	100.0 *
— 7.0....	99.8 * (tr. pt.	—15.0....	99.5 * (tr. pt.)	69.0....	99.11 *
+19.0....	99.44	— 6.0....	99.51	67.0....	98.41 *
75.0....	98.50	+36.0....	98.85	65.0....	97.5 * (tr. pt.)
115.0....	97.58	88.0....	97.90	88.0....	96.75
155.0....	96.02	130.0....	96.50	100.0....	96.27
158.0....	3 35	150.0....	2.23	145.0....	94.28
130.0....	2.19	125.0....	1.47	160.0....	4.62
95.0....	1.25	100.0....	0.91	136.0....	3.26
80.0....	1.04	75.0....	0.574	111.0....	2.20
71.0....	0.916			55.0....	1.04 *
				42.0....	0.525*

* Indicates cases in which a solid phase separated.

Solubility of *o m* and *p* Chloranilines in Benzene.
(Sidgwick and Rubie, 1921.)

The synthetic method was used. A solid phase separated in each case :

Ortho Chloraniline. t°.	Gms. *o* $ClC_6H_4NH_2$ per 100 gms. sat. sol.	Solid Phase.	Meta Chloraniline. t°.	Gms. *m* $ClC_6H_4NH_2$ per 100 gms. sat. sol.	Solid Phase.	Para Chloraniline. t°.	Gms. *p* $ClC_6H_4NH_2$ per 100 gms. sat. sol.	Solid Phase.
— 5.0...	96.09	*o* $ClC_6H_4NH_2$	—10.4...	93.48	*m* $ClC_6H_4NH_2$	70.0...	98.90	*p* $ClC_6H_4NH_2$
— 8.7...	91.19	»	—21.0...	86.18	»	60.0...	85.24	»
—14.4...	83.13	»	—25.0...	80.82	»	47.8...	65.36	»
—23.0...	72.63	»	—29.0*..	75.5	»+C_6H_6	34.8...	45.47	»
-25.0*..	68.5	»+C_6H_6	—24.4...	64.33	C_6H_6	25.7...	33.93	»
—21.0...	57.26	C_6H_6	—16.2...	47.02	»	14.0...	21.29	»
—17.4...	50.86	»	—14.0...	43.28	»	8.5...	15.43	»
—12.0...	39.50	»	—10.5...	35.48	«	2.4...	9.42	»
— 6.2...	26 46	»	— 5 0...	22.68	»	+1.5*..	8.5	»+C_6H_6
— 0.8...	14.95	»	— 0.4...	12.97	»	3.4...	4.66	C_6H_6
+ 1.5...	8.72	»	+ 2.0...	7.20	»	4.2...	2.87	»
5.5...	0.0	»	3.5...	0.0	»	5.1...	0.727	»

* Eutec.

Solubility of Chlor Aniline Sulfonic Acids, in Water.

(Philip and Colborne, 1924.)

Compound.	Formula.	t°.	Gms. anhydrous cmpd. per 100 gms. sat. sol.	Solid Phase.
p Chloraniline *o* sulfonic acid.	$pClC_6H_3NH_2\ o\ SO_3H$	0	0.313	$pClC_6H_3NH_2\ o\ SO_3H.H_2O$
p » *m* »	$pClC_6H_3NH_2\ m\ SO_3H$	0	1.131	$pClC_6H_3NH_2\ m\ SO_3H$
p » *m* »	»	0	1.160	$pClC_6H_3NH_2\ m\ SO_3H.H_2O$

Freezing-point Lowering Data (Solubilities see foot-note, p. 1001) are given for the following systems :

1.2.4 Dichlor Aniline + Picric Acid (Hertel, 1924.)
1.2.4 Dichlor Aniline + Diphenyl Amine (Giua and Cherchi, 1919.)
p Chlor *m* nitro Aniline + *p* Chlor *o* nitro Aniline (de Bruyn, 1917.)

ANILINE HYDROCHLORIDE $C_6H_5NH_2.HCl$.

Freezing-point data for mixtures of $C_6H_5NH_2.HCl + AsBr_3$ are given by Puschin and Löwy, 1926.

IodoANILINE Sulfonic Acids, $IC_6H_3(NH_2)SO_3H$.

Solubility of Each in Water at 25°. (Boyle, 1919.)

Compound.	Formula.	Gms. cmpd. per 100 gms. H_2O.
4 Iodo aniline 2 sulfonic acid ...	$C_6H_3NH_2(1)I(4)SO_3H(2)$	0.51
5 » 2 » ...	$C_6H_3NH_2(1)I(5)SO_3H(2)$	0.26
4 » 3 » ...	$C_6H_3NH_2(1)I(4)SO_3H(3)$	1.36
5 » 3 » ...	$C_6H_3NH_2(1)I(5)SO_3H(3)$	1.31
6 » 3 » ...	$C_6H_3NH_2(1)I(6)SO_3H(3)$	0.48
2 » 4 » ...	$C_6H_3NH_2(1)I(2)SO_3H(4)$	2.07
3 » 4 » ...	$C_6H_3NH_2(1)I(3)SO_3H(4)$	0.194

MethylANILINES, Mono and Di, $C_6H_5NHCH_3$, $C_6H_5N(CH_3)_2$.

Reciprocal Solubility of Each in Glycerol. (Parvatiker, and Mc Ewen, 1924.)

Results for Monomethyl Aniline. Gms. $C_6H_5NHCH_3$.				Results for Dimethyl Aniline. Gms $C_6H_5N(CH_3)_2$			
t°.	per 100 gms. sat. sol.	t°.	per 100 gms. sat. sol.	t°.	per 100 gms. sat. sol.	t°.	per 100 gms. sat. sal.
197.5	89.5	223.5	51.56	197.5	92.40	287.0	50.06
220.0	73.5	222.5	40.60	245.0	86.00	284.0	35.68
223.0	66.42	219.0	30.26	282.0	68.02	273.0	21.71
224.5	59.48	190.5	14.60	286.0	58.54	218.5	9.18

Critical Solution Temperatures of Methyl Aniline and of Ethyl Aniline in Various Solvents. (Thiry, 1925.)

For the constants of the Solvents see last table on page 1058.

Solvent.	Solubility of Methyl aniline. Crit. solution temp.	Percent conc. $C_6H_5NHCH_3$ at c. s. t.	Solubility of Ethyl aniline. Crit. solution temp.	Per cent conc. $C_6H_5NHC_2H_5$ at c. s. t.
Ethyl cyclopentane	—49.4	24.0	.....	....
Propyl cyclopentane	—43.0	22.5	.....	....
Methyl cyclohexane	—47.4	22.5	.....	....
Hexane	—18.6	27.5	—47.8	40.0
Methyl 3 pentane	—17.25	26.0	.....	....
Iso hexane	—14.0	27.0	—40.8	40.0
Trimethyl ethylmethane	— 7.65	27.5	—33.7	40.0

Nitroso DimethylANILINE, $NOC_6H_4N(CH_3)_2$.

Freezing-point lowering data (Solubilities, see foot-note, p. 1001) are given by Kremann and Wilk 1919 for mixtures of nitroso dimethyl aniline and each of the following compounds : acetamide, acridine, benzamide, α naphthylamine, *o*, *m* and *p* phenylene diamine, pyridine and quinoline. Similar results for mixtures containing benzamide, and β naphthylamine are given by Rheinboldt, Henning and Kirscheisen, 1925.

NitrANILINES, $NO_2.C_6H_4NH_2$, *o*, *m* and *p*.

Solubility of Each in Water.

(Sidgwick and Rubie, 1921.)

The Synthetic method was used. Both the triple points and the critical solution temperatures, for the two liquid layers which separate, were determined. Asterisks indicate that a solid phase is present.

Ortho Nitraniline.		Meta Nitraniline.		Para Nitraniline.	
t°.	Gms. *o* $NO_2C_6H_4NH_2$ per 100 gms. sat. sol.	t°.	Gms. *m* $NO_2C_6H_4NH_2$ per 100 gms. sat. sol.	t°.	Gms. *p* $NO_2C_6H_4NH_2$ per 100 gms. sat. sol.
69.7	100.0 *	114.6	100.0 *	147.0	100.0
68.0	99.43*	113.5	99.86*	144.8	98.96
66.0	98.29*	103.2	94.96*	136.8	96.38
63.0 (tr. pt)	97.5 *	99.0 (tr. pt)	93.5 *	128.0	93.86
68.0	97.23	125.6	90.02	124.2	92.52
91.0	96.16	159.9	83.60	115.5	90.0
142.0	92.06	169.3	79.82	129.2	86.82
160.2	89.50	176.7	75.77	148.6	81.27
188.5	81.88	185.8	57.55	167.8	68.19
206.2	66.89	186.1	50.57	170.4	62.58
210.3	52.30	187.5	(crit. sol. temp.)	172.0	51.07
211.0	(crit. sol. temp.)	185.2	36.94	172.5	(crit. sol. temp.)
208.6	36.71	180.5	25.34	172.0	39.49
194.2	17.50	164.2	13.08	169.5	28.82
178.5	10.74	136.5	6.04	141.5	9.29
164.5	7.19	83.4	1.70 *	123.5	5.16
128.4	2.95			92.0	2.79*

Solubility of Ortho Meta and Para Nitraniline in Benzene.

(Sidgwick and Rubie, 1921.)

Ortho Nitraniline.		Meta Nitraniline.		Para Nitraniline.	
t°.	Gms. *o* $NO_2C_6H_4NH_2$ per 100 gms. sat. sol.	t°.	Gms. *m* $NO_2C_6H_4NH_2$ per 100 gms. sat. sol.	t°.	Gms. *p* $NO_2C_6H_4NH_2$ per 100 gms. sat. sol.
67.2	95.35	110.3	96.37	143.7	96.78
62.0	88.69	105.4	90.55	132.3	81.71
55.0	78.64	99.2	79.96	122.5	64.03
47.4	58.96	88.7	57.95	119.5	54.15
39.2	40.92	78.4	32.42	108.6	25.46
23.2	21.52	60.9	14.18	95.0	11.42
10.5	12.26	38.2	4.42	70.0	3.21

Solubility of Ortho, Meta and Para Nitraniline in Several Solvents

(Collett and Johnson. 1926.)

Solvent in each Case.	Solubility of : Ortho Nitraniline. Gms. *o* $NO_2C_6H_4NH_2$ per 100 gms. solvent. t°.		Solubility of : Meta Nitraniline. Gms. *m* $NO_2C_6H_4NH_2$ per 100 gms. solvent. t°.		Solubility of : Para Nitraniline Gms. *p* $NO_2C_6H_4NH_2$ per 100 gms. solv. t°.	
Water	25.0	0.1212	25.0	0.0910	25.0	0.0568
»	40.1	0.2423	40.1	0.1785	40.1	0.1157
Benzene	25.0	20.80	25.0	2.718	25.0	0.5794
»	....	.....	40.1	5.137	40.1	1.050
Ethyl alcohol(abs.)	....	.....	0.0	4.035	0.0	3.382
»	25.0	27.87	25.0	7.778	25.0	6.048
»	....	.....	....	.....	40.1	8.234
» (95 %)	....	.....	25.0	7.155	25.0	5.674
Chloroform	0.0	11.17	0.0	1.358	0.0	0.4331
»	...	.....	25.0	3.216	25.0	0.929
»	...	.....	40.1	6.102	40.1	1.559

Solubility of Ortho Nitraniline (m. pt. 69°.3) in Several Solvents.

(Collett and Johnston, 1926.)

Gm. mols. $o\ NO_2.C_6H_4.NH_2$ per 100 gm. mols. saturated solution in

t°.	Acetone.	Ethyl acetate.	Chloro-form.	Benzene.	Ethyl ether.	Ethyl alcohol.	Carbon tetrachloride.	Nitro benzene.	Dibrom acetylene (C_2Br_2).
25...	40.0	34.1	23.0	10.5	18.7	8.5	–	24.8 (?)	24.8 (?)
30...	44.6	38.3	28.4	13.6	21.5	10.4	–	29.0	29 0
40...	54.5	48.2	42.0	27.6	30.6	18.7	4.6	39.8	39.8
50...	65.6	61.6	60.0	51.6	50.1	40.3	21 1	56.4	56.4
60...	79.2	77.6	77.3	75.8	74.0	74.0	73.9	76.0	76.0

100 gms. Carbon Tetrachlor. dissolve 1.18 gms. *o* Nitraniline at 20° (Pawlewski, 1914, 1926.)
100 gms. Chloroform dissolve 27.83 » » » » » »

Solubility of Meta Nitraniline (m. pt. 111°.8) in Several Solvents.

(Collett and Johnston, 1926.)

Gm. mols. $m\ NO_2.C_6H_4.NH_2$ per 100 gm. mols saturated solution in

t°.	Acetone.	Ethyl acetate.	Chloro-form.	Benzene.	Ethyl alcohol.	Ethyl ether.	Carbon tetrachloride.	Nitro benzene	Dibrom acetylene.
25.0.....	19.5	16.1	2.6	1.5	2.4	3.6	–	11.3	–
30.0.....	21.7	17.3	3.1	1.8	2.4	4,5	–	13.0	–
40.0.....	26.3	20.0	4.4	2.8	4.1	6.3	–	16.7	–
50.0.....	31.2	23.4	6.6	4 1	5.6	8 4	–	21.3	7.8
60.0.....	36 9	28.2	10.8	7.2	8.5	11.3	–	27.0	12.5
70.0	43.7	35.6	19.0	13.3	14.1	16.4	–	35.6	20.0
80.0.....	52.4	46.0	33.1	25.2	25.8	25.9	–	46.0	33.0
90.0.....	64.1	59.2	51.0	48.7	49.5	42.1	7.0	59.2	50.8
100.0.....	78.9	76.0	73.3	72.7	73.0	68.6	86 7	76.0	71.7
110.0.....	96.8	96.1	95.5	95.6	94.9	94.6	–	96.0	95.6

Solubility of Para Nitraniline (m. pt. 147°.5) in Several Solvents.

(Collett and Johnson, 1926).

Gm. mol. $p\ NO_2.C_6H_4.NH_2$ per 100 gms. mol. saturated solution in

t°.	Acetone.	Ethyl acetate.	Chloro-form.	Benzene.	Ethyl ether.	Ethyl alcohol.	Nitro benzene.	Dibrom acetylene.
25.....	–	–	0.8	0.3	–	2.0	6.7	–
30.....	–	–	1.0	0.4	–	2.2	7.5	–
40.....	–	11.4	1.3	0.6	–	2.9	9.3	–
50.....	23.8	13.4	1.8	0.8	–	3.9	11.7	–
60.....	26.5	15.8	2.5	1.2	3.4	5.1	14.9	–
70.....	29.7	18.8	3.8	1.7	3.8	6.6	19.3	–
80.....	33.5	22.9	5.3	2.6	4.8	9.4	24.6	6.5
90.....	38.6	28.6	8.8	4.3	5.7	15.3	31.2	11.0
100.....	45.1	35.8	16.1	8.4	7 9	25.9	39.2	18.8
110.....	53.2	44.6	29.8	16 8	12.7	39.2	48.6	30.9
120.....	63.0	56.5	51.0	40.9	32.4	54.7	59.0	46.2
140.....	88.8	87.1	86.5	84.8	85.6	87.5	87.1	84.8

The results in the above tables for the solvents Nitrobenzene and Dibromacetylene are taken from the paper of Bogojavlewski, Bogolinbov and Vinogradov (Chem. Abs, 1, 2874, 1907.)

Solubility of *o*, *m* and *p* Nitraniline, Separately, in Para Cymene and in Xylene

Gms. of each compound per 100 gms. solvent.

Solvent.	t°.	$o\ NO_2.C_6H_4.NH_2$.	$m\ NO_2.C_6H_4.NH_2$.	$p\ NO_2.C_6H_4.NH_2$.	Authority.
Para Cymene (b. pt. 176°-176°.5).....	30	6.33	1.36	0.83	(Wheeler, 1920.)
m Xylene	15	11.6	1.74	0.28	(Chapas, 1921.)

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given by Kohman, 1925, for mixtures of *o* + *m* nitraniline, *o* and *p* nitraniline, *m* and *p* nitraniline and *o*, *m* + *p* nitraniline. Similar data are given by Giua, Marcellino and Curti, 1920, for *o* nitraniline + 1.2.4 chlorodinitrobenzene and for *m* nitraniline + 1.2.4 chlorodinitrobenzene. Results for mixtures of *m* nitraniline and Michler's Ketone are given by Pfeiffer, 1924.

Tetra NitrANILINE 1.2.3.5 $(NO_2)_4C_6H\ NH_2$.

Solubility in Several Solvents at 0°. (Taylor and Rinkenbach. 1923.)

Solvent.	Gms. $(NO_2)_4C_6HNH_2$ per 100 gms. solvent.	Solvent.	Gms. $(NO_2)_4C_6HNH_2$ per 100 gms. solvent.
Water	0.007	Chloroform	0.010
Methyl alcohol	0 45	Carbon tetrachloride	0.0036
Ethyl alcohol	0.34	Carbon bisulfide	0.0056
Ethyl ether	0.081	Benzene (3°.9)	0.13
Acetone	7.50	Toluene	0.188

Tri NitrANILINE $(NO_2)_3C_6H_2.NH_2$.

100 gms. glycol diacetate ($CH_3.COO.CH_2.CH_2.COO.CH_3$, b. pt. 188°-189°.6) dissolve 2.4 gms. $(NO_2)_3C_6H_2.NH_2$ at 25°. (Taylor and Rinkenbach, 1926.)

ANILINE SULFONIC ACIDS, *o* and *m* $C_6H_4(NH_2).SO_3H$.

Solubility of Each in Water. (Philip and Colborne, 1924.)

Results for Aniline Ortho Sulfonic Acid.

t°.	Gms. *o* $C_6H_4(NH_2)SO_3H$ per 100 gms. sat. sol.	Solid Phase.
0.0....	0.794	*o* $C_6H_4(NH_2)SO_3H.H_2O$
8.25...	1.130	»
12.3....	1.305	»
15.55...	1.465	*o* $C_6H_4(NH_2)SO_3H$
16.75...	1.52	»
25.0....	1.93	»
41.3....	3.01	»
55 0....	4.29	»
70.0....	6.36	»
85.0....	8.98	»

Results for Aniline Meta Sulfonic Acid (Metanilic Acid).

t°.	Gms. *m* $C_6H_4(NH_2)SO_3H$ per 100 gms. sat. sol.	Solid Phase.
0.0....	0.790	*m* $C_6H_4(NH_2)_2SO_3H$
7.75...	1.022	»
16.75...	1.32	»
24.95...	1.635	»
40.0....	2.395	»
55.0....	3.42	»
70.0....	4.70	»
85.0....	6.50	»
0.0....	1.07	$2C_6H_4(NH_2)SO_3H.3H_2O$
8.35...	1.61	» (unstable)
15.55...	2.64	»
16.8....	2.37	»

Considerable difficulty was experienced in preventing supersaturation of the anhydrous meta aniline sulfonic acid.

ANISIC ACID (*p* Methoxy Benzoic Acid) $CH_3O.C_6H_4.COOH$.

Distribution of Anisic Acid Between : (Smith, 1921-1922.)

Water and Xylene at 25°.

Millimols Anisic Acid per liter of H_2O layer (C_1).	Millimols Anisic Acid per liter of Xylene layer (C_2).	$\frac{C_2}{C_1}$.
0.243	0.195	0.802
0.381	0.494	1.30
0.467	0.700	1.50
0.682	1.50	2.20

Water and Chloroform at 25°.

Millimols Anisic Acid per liter of H_2O layer (C_1).	Millimols Anisic Acid per liter of $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.125	0.625	5.00
0.162	0.875	5.38
0.206	1.206	5.85
0.225	1.75	6.36

o ANISIDINE *o* $C_6H_4(OCH_3)NH_2$.

Reciprocal Solubility of Ortho Anisidine and Glycerol.
(Parvatiker and Mc Ewen, 1924.)

t° of Miscibility.	Gms. Anisidine per 100 gms. sat. sol.	t° of Miscibility.	Gms. Anisidine per 100 gms. sat. sol.
141.0.....	34.25	145.0.....	61.25
143.0.....	43.57	142.5.....	73.09
144.5.....	51.69		

ANISOLE $C_6H_5OCH_3$.

Reciprocal Solubility of Anisole and Glycerol.

(Mc Ewen, 1923.)

t° of solution.	Gms. $C_6H_5OCH_3$ per 100 gms. sat. sol.	t° of solution.	Gms. $C_6H_5OCH_3$ per 100 gms. sat. sol.
161.5	6.07	275.5	53.41
185.3	11.29	273.5	69.46
250.5	27.63	263.5	78.80
274.5	44.02	230.5	90.12

1.2.4 DinitrANISOLE $(NO_2)_2C_6H_3.OCH_3$ 1.2.4.

Solubility in Several Solvents.

(Desvergnes, 1924.)

Commercial dinitranisole was dissolved in twice its weight of nitric acid ($d = 1.40$) and after 24 hours the crystals were washed with cold nitric acid, with water and finally with alcohol. The m. pt. was 94°.58.

Solvent.	t°.	Gms. $(NO_2)_2C_6H_3OCH_3$. per 100 gms. solvent.	Solvent.	t°.	Gms. $(NO_2)_2C_6H_3OCH_3$ per 100 gms. solvent.
Water	15	0.0155	Chloroform	15	34.00
»	50	0.0136	($d_{15} = 1.4887$)	50	102.96
»	100	0.4780*	Ether (anhy.)	15	3.821
Ethyl acetate	15	25.07	($d_{15} = 0.7193$)	33	6.780
($d_{15} = 0.9048$)	50	78.63	Pyridine	15	73.51
Acetone	15	85.66	($d_{15} = 0.9805$)	50	198.98
($d_{15} = 0.7998$)	50	218.97	CS_2	15	0.356
Ethyl alcohol (96°)	15	1.887	($d_{15} = 1.2723$)	37	0.889
($d_{15} = 0.8112$)	50	6.448	CCl_4	15	0.356
Ethyl alcohol (abs.)	15	2.997	($d_{15} = 1.6012$)	50	1.196
($d_{15} = 0.7967$)	50	7.185	Toluene	15	16.63
Benzene	15	30.27	($d_{15} = 0.8733$)	50	79 57
($d_{15} = 0.8826$)	50	128.43			

* At this temperature water saponifies the dinitranisole yielding the corresponding dinitrophenol.

1.2.4.6 TrinitrANISOLE $(NO_2)_3C_6H_2.OCH_3$ 1.2.4.6.

Solubility in Several Solvents.

(Desvergnes, 1924.)

Solvent.	t°.	Gms. $(NO_2)_3C_6H_2.OCH_3$ per 100 gms. solvent.	Solvent.	t°.	Gms. $(NO_2)_3C_6H_2.OCH_3$. per 100 gms. solvent.
Water	15	0.020	Benzene	15	94.98
»	50	0.137	»	50	597.90
»	100	0.389*	Chloroform	15	25.60
Ethyl acetate	15	89.44	»	50	334.50
» »	50	368.50 *	Ether (anhy.)	15	4.183
Acetone	15	194.00	»	34	7.86
»	50	813.22 *	Pyridine	15	40.35**
Ethyl alcohol (96°)	15	2.31	»	50	221.23
» »	50	17.79 *	CS_2	15	0.426
Ethyl alcohol (abs.)	15	2.37	»	36	1.11
» »	50	21.36 *	CCl_4	15	0.511
Methyl alcohol	15	5.24	»	50	3.65
» »	50	27.65 *	Toluene	15	86.49
			»	50	421.53

* Partial saponification to nitrophenol and isopicric acid occurs.

** A picrate of pyridine having the formula $C_6H_2OH(NO_2)_3.2C_5H_5N$ is formed.

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given for the following systems :

Trinitro anisole + Picryl sulfide	(Chaumeil and Thomas, 1923.)
2.4.6 Trinitro anisole + 2.4 6 Trinitro phenetol	(Brady and Horton, 1925.)
3 Nitro 4 Ethoxy anisole + 2 Nitro 4 Ethoxy anisole	(Robinson and Smith, 1926.)
4 Nitro 2 *m* Nitro benzyloxy Anisole + 5 Nitro 2 *m* Nitrobenzyloxy anisol	(Oxford and Robinson, 1926.)
4 Nitro 2 *p* Nitro benzyloxy anisole + 5 Nitro 2 *p* Nitrobenzyloxy anisol	» » »

ANTHRACENE $C_{14}H_{10}$.

Solubility of Anthracene in Various Organic Solvents.

(Clark, 1919*a*.)

The sample of anthracene was 99.8 % pure and melted at 212°.7.

Solvent.	*d* of solvent.	B. pt of solvent.	Gms. Anthracene per 100 gms. of solvent at 15°.5.	30°.	50°.	80°.	100°.
Benzene	0.880	80 – 80.5	1.05	2.10	–	–	–
Toluene	0.870	110 –110.3	0.53	1.90	3.10	7.88	12.20
Naphtha (refined)	0.865	145 –166	0.46	1.42	2.90	6.58	10.10
» (crude solvent)	0.893	152 –179	0.50	1.71	3.25	7.20	8.82
» (heavy)	0.909	165 –185	0.32	1.35	3.10	7.65	10.53
Chloroform	1.495	60.4– 62.0	0.83	1.64	7.10	–	–
Carbon disulfide	1.270	45.7– 47.0	0.52	1.62	–	–	–
Acetone	0.800	56.0– 57.0	0.55	1.42	2.48	–	–
Pyridine (light)*	0.952	125 –150	0.85	2.15	4.10	11.22	16.72
» (heavy)*	1.057	202 –247	0.38	1.40	2.98	7.87	8.82
» (hydrated)**	1.050	94 – 96	0.0	0.0	0.001	1.53	–
Carbon tetrachloride	1.610	75.5– 76.5	0.67	1.15	1.30		–
Gasoline	0.742	90 –164	0.12	0.37	0.76	–	–
Ether	0.720	35 – 40.2	0.70	1.03	–	–	–

* These are the bases derived from coal tar oils by abstraction with sulfuric acid and liberation of the base with caustic soda. They probably contain but very little pyridine, C_5H_5N.

** $C_5H_5N.3H_2O$.

Solubility of Anthracene in Benzene at 30°.5 as Influenced by very Slight Traces of Water in the Benzene.

(Cohen and Miyake, 1926.)

Thousandths of a wt % of H_2O in the C_6H_6.	0.0	38.9	88.9	saturated
Gms. anthracene per 100 gms. sat. sol.	2.00	2.00	1.98–1.99	1.98

100 gms. carbon tetrachloride dissolve 0.47 gms. Anthracene at 20°. (Pawlewski, 1914, 1926.)
» » chloroform » 1.74 » » » » »

Solubility of Anthracene in Cymene. (Wheeler, 1920.)

t°	25°.	30°.	100°.	176°.
Gms. anthracene per 100 gms. cymene	1.57	1.72	9.24	98.60

Solubility of Anthracene in Mixtures of Acetone and Ethyl Alcohol.

(Disselkamp. 1926.)

Wt. per cent acetone in solvent mixture.	Gms. Anthracene per 100 gms. sat. sol. at 50°.	70°.	85°.	100°.
100	2.3	3.7	6.0	10.0
75	1.6	3.2	5.5	8.1
50	1.25	2.4	4.0	6.2
25	0.75	1.4	2.4	4.05
Alcohol	0.4	0.7	1.4	3.45

Solubility of Anthracene in Mixtures of Solvents.

(Disselkamp, 1926.)

The synthetic method of Alexieff was used. A special shaking apparatus was employed. The individual determinations were plotted and the following results read from the curves.

Results for Mixtures of Ethyl Alcohol and Benzene.

Wt. % C_6H_6 in solvent mixture.	Gms. Anthracene per 100 gms. sat. solution at				
	45°.	60°.	75°.	90°.	105°.
100	3.1	4.7	7.6	12.1	16.0
87.5	2.4	4.3	6.9	10.8	14.6
75.0	1.8	2.4	5.8	9.3	8.2
50.0	1.2	2.1	3.5	5.8	8.2
25.0	0.55	1.2	1.9	3.2	4.3
12.5	0.3	0.8	1.4	2.3	3.4
Alcohol	0.23	0.55	1.05	1.68	2.5

Results for Mixtures of Ethyl Alcohol and Carbon Disulfide.

Wt. % CS_2 in solvent mixture.	Gms. Anthracene per 100 gms. sat. solution at				
	40°.	55°.	70°.	80°.	90°.
100	3.3	5.2	8.5	12.3	–
80	2.6	4.5	7.5	10.6	15.8
60	1.8	3.0	4.8	6.5	8.9
40	0.85	1.55	2.75	3.9	5.4
20	0.55	0.8	1.55	2.2	3.0
Alcohol	0.23	0.45	0.8	1.2	1.8

Results for Mixtures of Acetone and Chloroform.

Wt. % Acetone in solvent mixture.	Gms. Anthracene per 100 gms. sat. solution at				
	45°.	60°.	75°.	90°.	100°.
100	1.6	3.0	4.6	7.1	9.7
75	1.4	2.6	4.2	6.7	9.2
50	1.2	2.5	4.1	6.5	9.1
25	1.5	3.9	4.6	7.3	10.2
10	1.95	3.6	5.5	8.5	11.9
$CHCl_3$	2.5	4.5	6.4	9.6	13.0

Results for Mixtures of Acetone and Carbon Disulfide.

Wt. % Acetone in solvent mixture.	Gms. Anthracene per 100 gms. sat. solution at			
	35°.	50°.	65°.	80°.
100	1.1	2.9	4.2	5.1
80	2.0	3.3	5.2	8.6
60	2.7	4.4	7.2	11.9
40	3.5	5.6	8.9	14.5
20	4.1	6.4	10.0	15.6
10	3.3	5.5	8.7	13.7
CS_2	2.7	4.5	7.4	12.3

Results for Mixtures of Carbon Tetrachloride and Carbon Disulfide.

Wt. % CCl_4 in solvent mixture.	Gms. Anthracene per 100 gms. sat. solution at				
	35°.	50°.	65°.	80°.	90°.
100	0.44	1.0	2.13	3.4	4.6
80	1.15	1.9	3.2	5.1	7.1
60	1.7	2.7	4.3	6.7	9.6
40	2.15	3.4	5.4	8.4	12.2
20	2.45	3.9	6.5	9.9	14.7
CS_2	2.6	4.1	7.5	11.5	–

Results for Mixtures of Carbon Tetrachloride and Toluene.

Wt. % CCl_4 in solvent mixture.	Gms. Anthracene per 100 gms. sat. sol. at 40°.	50°.	65°.	80°.	95°.	100°.
100	2.5	3.2	5.0	8.0	12.4	15.0
80	2.1	2.9	4.65	7.4	11.0	13.1
60	1.7	2.5	4.0	6.5	9.6	9.7
40	1.3	2.1	3.4	5.6	8.2	9.7
20	0.9	1.6	2.8	4.5	6.8	7.9
Toluene	0.55	1.1	2.1	3.4	5.4	6.2

Solubility of Anthracene in Mixtures of :

Benzene and Carbon Disulfide.

Wt. % C_6H_6 in solvent mixture.	Gms. Anthracene per 100 gms. sat. sol. at 40°.	55°.	70°.	85°.
100	2.5	4.15	6.6	10.4
66.7	3.0	4.8	8.1	13.4
50.0	3.1	5.0	8.5	14.8
CS_2	3.2	5.2	8.7	15.1

Benzene and Chloroform.

Wt. % C_6H_6 in solvent mixture.	Gms. Anthracene per 100 gms. sat. sol. at 50°.	70°.	85°.	100°.
100	3.55	6.5	10.3	16.1
80	3.3	6.0	9.0	13.1
50	3.1	5.8	8.6	12.3
$CHCl_3$	3.0	5.6	8.3	11.8

Solubility of Anthracene in Mixtures of :

Toluene and Carbon Disulfide.

Wt. % $C_6H_5CH_3$ in solvent.	Gms. Anthracene per 100 gms. sat. sol. at 40°.	55°.	70°.	85°.
100	2.1	3.8	6.0	9.4
75	2.55	4.4	7.0	11.6
50	2.8	4.75	7.6	13.0
CS_2	3.1	5.0	8.3	14.5

Toluene and Chloroform.

Wt. % $C_6H_5CH_3$ in solvent.	Gms. Anthracene per 100 gms. sat. sol. at 40°.	60°.	85°.
100	1.95	4.5	8.0
71.4	2.1	4.1	7.7
50.0	2.2	3.95	7.6
25.0	2.2	4.0	7.7
$CHCl_3$	2.1	4.4	7.85

Results for Mixtures of Benzene and Toluene.

Wt. % $C_6H_5CH_3$ in solvent mixture.	Gms. Anthracene per 100 gms. sat. sol. at 40°.	60°.	75°.	90°.
100	2.45	4.45	6.7	10.6
50	2.6	4.7	8.2	11.4
C_6H_6	2.75	5.1	8.7	12.4

Solubility of Anthracene at 17°.95 in Mixtures of :

(Joscht, 1914, 1926.)

Benzene and Ethyl Acetate.

Gms. C_6H_6 per 100 gms. solvent.	Gms. $C_{14}H_{10}$ per 100 gms. solvent.	Gms. C_6H_6 per 100 gms. solvent.	Gms. $C_{14}H_{10}$ per 100 gms. solvent.
0.0	0.120	50.0	0.180
10.0	0.139	60.0	0.199
20.0	0.137	70.0	0.210
30.0	0.163	80.0	0.204
40.0	0.177	90.0	0.226
49.3	0.164	100.0	0.223

Acetone and Carbon Tetrachloride.

Gms. CCl_4 per 100 gms. solvent.	Gms. $C_{14}H_{10}$ per 100 gms. solvent.	Gms. CCl_4 per 100 gms. solvent.	Gms. $C_{14}H_{10}$ per 100 gms. solvent.
100.0	0.470	40.0	0.971
90	0.740	30.0	0.967
80	0.873	20.0	0.966
70	0.936	10.0	0.962
60	0.962	0.0	0.938
50	0.985		

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given for mixtures of anthracene and each of the following compounds :

o, *m* and *p* dinitrobenzene, 1.3.5 trinitrobenzene, *o*, *m* and *p* nitrophenol, 1.2.4 dinitrophenol, 1.2.4 dinitrotoluene, 1.2.4.6 trinitrotoluene (Kremann and Müller, II, 1921); carbazole, phenanthrene, retene, chrysene, methylacridine (Pascal, 1921); picric acid (Rheinboldt, Henning and Kirscheisen, 1925); picramide, picrylchloride (Efremov, 1918); 2.4.6 trinitrotoluene (Efremov, 1919); styphnic acid (Efremov, 1919 *a*); quinone (Kremann, Sutter, Sitte and Strzelba, 1922); 1.3.4, 1.2.6 and 1.3.5 dinitrotoluene (Kremann, Hönigsberg and Mauermann, 1923).

ANTHRANILIC ACID (o Aminobenzoic Acid) $o\ NH_2C_6H_4COOH$.

Distribution of Anthranilic Acid Between:

(Smith, 1921-22.)

Water and Chloroform at 25°. Millimols. $o\ NH_2C_6H_4COOH$ per liter.			Water and Ether at 25°. Millimols. $o\ NH_2C_6H_4COOH$ per liter.			Water and Acetone at 25°. Millimols. $o\ NH_2C_6H_4COOH$ per liter.		
Water layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.	Water layer (C_1).	Ether layer (C_2).	$\frac{C_2}{C_1}$.	Glycerol layer (G).	Acetone layer (A).	$\frac{A}{G}$.
4.50	0.60	0.133	0.52	0.56	1.075	1.05	2.20	2.09
6.62	0.96	0.145	1.00	1.05	1.05	1.55	3.80	2.45
10.00	1.54	0.154	1.86	2.21	1.19	3.20	8.95	2.80
16.10	2.87	0.178	3.57	4.04	1.13	4.60	14.70	3.20
			6.04	6.80	1.125			

100 gms. Cymene dissolve 0.747 gms. Anthranilic acid at 25°. (Wheeler, 1920.)

ANTHRAQUINONE $C_6H_4(CO)_2.C_6H_4$.

100 gms. carbon tetrachloride dissolve 0,043 gm. $C_6H_4(CO)_2C_6H_4$ at 20° (Pawlewski, 1914, 1926.)
» » chloroform » 0,54 » » » » »

Solubility of Anthraquinone in Mixtures of Solvents at 17°.93.

(Joscht, 1914, 1926.)

Results for Mixtures of Carbon Tetrachloride and:

Acetone $CCl_4+CH_3COCH_3$.		Benzene $CCl_4+C_6H_6$.		Chloroform CCl_4+CHCl_3.		Ethylacetate $CCl_4+CH_3COOC_2H_5$	
Gms. CCl_4 per 100 gms. of mixture.	Gms. $C_{14}H_8O_2$ per 100 gms. solvent.	Gms. CCl_4 per 100 gms. of mixture.	Gms. $C_{14}H_8O_2$ per 100 gms. solvent.	Gms. CCl_4 per 100 gms. of mixture.	Gms. $C_{14}H_8O_2$ per 100 gms. solvent.	Gms. CCl_4 per 100 gms. of mixture.	Gms. $C_{14}H_8O_2$ per 100 gms. solvent.
97.46	0.059	100.0	0.043	100.0	0.043	100.0	0.043
95.0	0.072	90.0	0.060	90.0	0.072	90.0	0.065
90.0	0.089	80.0	0.071	80.0	0.097	80.0	0.087
80.0	0.115	70.0	0.095	70.0	0.139	70.0	0.089
70.0	0.128	64.44	0.105	60.0	0.183	60.0	0.097
66.8	0.122	60.0	0.108	57.74	0.215	55.8	0.095
60.0	0.130	50.0	0.128	50.0	0.231	50.0	0.111
50.0	0.131	40.0	0.157	40.0	0.285	40.0	0.117
30.0	0.133	30.0	0.174	30.0	0.341	30.0	0 115
20.0	0.127	20.0	0.185	20.0	0.408	20.0	0.115
10.0	0.126	10.0	0.200	10.0	0.472	10.0	0.129
0.0	0.121	0.0	0.225	0.0	0.542	0.0	0.120

Results for Mixtures of:

$CHCl_3+CH_3COCH_3$.		$CHCl_3+C_6H_6$.		$CHCl_3+CH_3COOC_2H_5$.		$C_6H_6+CH_3COOC_2H_5$.	
Gms. $CHCl_3$ per 100 gms. of mixture.	Gms. $C_{14}H_8O_2$ per 100 gms. solvent.	Gms. $CHCl_3$ per 100 gms. of mixture.	Gms. $C_{14}H_8O_2$ per 100 gms. solvent.	Gms. $CHCl_3$ per 100 gms. of mixture.	Gms. $C_{14}H_8O_2$ per 100 gms. solvent.	Gms. C_6H_6 per 100 gms. of mixture.	Gms. $C_{14}H_8O_2$ per 100 gms. solvent.
0.0	0.121	0.0	0.223	0.0	0.120	0.0	0.121
10	0.121	10	0.218	10.0	0.113	10	0.132
20	0.117	20	0.236	20.0	0.114	20	0.150
30	0.117	30	0.244	30.0	0.097	30	0.166
40	0.111	40	0.244	40.0	0.106	40	0.176
50	0.115	45.9	0.249	50.0	0.104	50	0.184
60	0.123	50	0.263	54.1	0.100	52.6	0.190
65.32	0.121	60	0.287	60.0	0.119	60	0.206
70	0.137	70	0.325	70.0	0.142	70	0.230
80	0.177	80	0.365	90.0	0.304	80	0.232
90	0.276	90	0.437	95.0	0.357	90	0 244
95	0.328	100	0.542	100.0	0.542	100	0.223

Trioxy methylANTHRAQUINONE (Emodin) $C_{15}H_{10}O_5$.

Solubility in Several Solvents. (Beal and Katti, 1925.)

The saturated solutions were prepared by boiling an excess of the compound with the solvent, allowing to stand at room temperature and filtering.

Solvent.	Gms. Emodin per 100 cc. sat. sol.	Solvent.	Gms. Emodin per 100 cc. sat. sol.
Benzene	0.0405	Chloroform	0.0705
Carbon tetra chloride	0.0102	Ether	0.1400
Carbon disulfide	0.0088		

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given by Coppens, 1925, for mixtures of α chlor anthraquinone and β chlor anthraquinone.

ANTIMONY Sb.

Data for the distribution of antimony between two liquid phases composed respectively of Zn and Pb, Zn and Bi, and Al and Pb are given by Tammann and Schaftmeister, 1924.

ANTIMONY TriBROMIDE $SbBr_3$.

Freezing-point lowering data are given for the following systems.

Antimony tri bromide + Arsenic tri bromide (Puschin and Löwy, 1926.)
» » + Benzaniline (Vanstone, 1925.)
» » + Benzanilide »

ANTIMONY OxyCHLORIDE $Sb_4O_5Cl_2$.

Solubility in Aqueous Solutions of Hydrochloric Acid at 25°.
(Lea and Wood, 1924.)

Hydrated antimonious oxide was added in excess to solutions of pure HCl of varying concentrations and the mixtures kept in a thermostat for two months. They were shaken from time to time by hand. Portions were removed for analysis and after another month other portions were removed for a duplicate analysis. The results agreed satisfactorily, thus indicating that equilibrium had been reached. The results gave a smooth curve, thus showing the absence of a transition point. The solid phase gradually took on a crystalline appearance and on analysis corresponded to $Sb_4O_5Cl_2$.

Gm. atoms per liter of sat. sol.		Gm. atoms per liter of sat. sol.		Gm. atoms per liter of sat. sol.	
Cl.	Sb.	Cl.	Sb.	Cl.	Sb.
0.194	0.00012	1.56	0.0116	2.81	0.177
0.402	0.000172	1.74	0.0194	3.36	0.309
0.601	0.000298	1.90	0.0299	3.85	0.440
0.799	0.000610	2.10	0.0522	4.79	0.745
1.02	0.00124	2.29	0.0755	5.93	1.13
1.32	0.00565	2.54	0.120		

ANTIMONY TriCHLORIDE $SbCl_3$.

100 gms. sat. sol. of $SbCl_3$ in H_2O contain 90.90 gms. $SbCl_3$ at 25° (Miyake, 1924, 1925.)
» » 10.55 % HCl » 90.07 » »

Data for the system $SbCl_3 + KCl + H_2O$ are given. The double salts $2\,KCl\,SbCl_3$ and $7\,KCl\,3\,SbCl_3$ were found but no mixed crystals as mentioned by Jordis, 1903.

100 gms. acetylene tetrachloride ($C_2H_2Cl_4$) dissolve 21.75 gms. $SbCl_3$ at 25°. (de Pauw, 1922, 1926.)

100 gms. of a sat. solution of antimony pentachloride ($SbCl_5$) in Selenium oxychloride ($SeOCl_2$) contain 38.64 gms. $SbCl_5$ at 25°. (Wise, 1923.)

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given for mixtures of antimony trichloride and each of the following compounds:

Mercuric chloride, Potassium », Stannous », Stannic » (Kendall, Crittenden and Miller, 1923.)

Benzanilide. (Vanstone, 1925.)
Benzaniline. » »
β Chlor Naphthalene. (Vasiliev, 1917.)
α Nitro Naphthalene. » »

ANTIMONY TriIODIDE SbI_3.

Freezing-point lowering data are given by Vasilev, 1921, for mixtures of SbI_3 + AsI_3 and SbI_3 + SnI_3.

ANTIMONY NitrosophenylHYDROXYLAMINE.

100 gms. H_2O dissolve $4.5.10^{-5}$ gms. Antimony nitrosophenyl hydroxylamine at 18°. (Martin.)

ANTIMONY TriSULFIDE Sb_2S_3.

Freezing-point lowering data are given for the following systems :

Antimony trisulfide + Bismuth sulfide. (Takahashi, 1919.)
» » + Lead sulfide. (Jitsuka, 1919.)
» » + Silver sulfide. (Konno, 1919.)

Triphenyl antimony sulfide $[SbS(C_6H_5)_3]$ + Triphenyl phosphine oxide $[PO(C_6H_5)_3]$
» » » » + Triphenyl phosphine sulfide $[PS(C_6H_5)_3]$
» » » » + Triphenyl arsine sulfide $[AsS(C_6H_5)_3]$
» » » » + Triphenyl arsine oxide $[AsO(C_6H_5)_3]$
(Pascal, 1923.)

ANTIPYRINE $C_{11}H_{12}N_2O$.

SOLUBILITY IN WATER, DETERMINED BY THE FREEZING-POINT METHOD.
(Kremann and Janetzky, 1923.)

t° of primary crystallization.	Gms. Antipyrine per 100 gms. sat. sol.	Solid Phase.	t° of primary crystallization.	Gms. Antipyrine per 100 gms. sat. sol.	Solid Phase.
—0.9.....	16.7	Ice	20.2.....	57.3	Antipyrine
—1.7.....	26.2	»	24.9.....	61.9	»
—2 8.....	35.4	»	30.4.....	67.0	»
—3.3 (Eutec.)..	37.5	» + Antipyrine	38.0.....	72.5	»
0.0.....	39.1	Antipyrine	46.5.....	78.1	»
2.5.....	41.2	»	56.0.....	83.0	»
6.1.....	43.6	»	70.0.....	88.5	»
7.0.....	45.5	»	88.0.....	94.7	»
11.0.....	47.8	»	95.0.....	96.1	»
15.5.....	52.6	»	109.0.....	100.0	»

The authors also give data for mixtures of antipyrine and caffeine and for mixtures of antipyrine, caffeine and water.

DISTRIBUTION OF ANTIPYRINE AT 25° BETWEEN. (Emery and Wright, 1921.)

Water and Chloroform.		1.0 normal Aq. H_2SO_4 and $CHCl_3$.		0.1 normal *o* $C_6H_4(OH)COONa$ and $CHCl_3$.	
Gms. Antipyrine per 100 cc.		Gms. Antipyrine per 100 cc.		Gms. Antipyrine per 100 cc.	
H_2O layer.	$CHCl_3$ layer.	Aq. layer.	$CHCl_3$ layer.	Aq. layer.	$CHCl_3$ layer.
0.0076	0.1924	0.0908	0.1092	0.0092	0.1908
0.0074	0.3936	0.1884	0.2116	0.0212	0.3788
0.0528	0.9472	0.4644	0.5356	0.0524	0.9416
0.1208	1.8792	0.9452	1.0548	0.416	4.584
0.3950	4.605	2.315	2.685	0.424	4.576
1.1600	8.840	4.568	5.432	1.25	8.75

100 gms. abs. C_2H_5OH dissolve 74.09 gm. Antipyrine at 20-25°.
100 gms. Quinoline » 19.00 » » at 20-25°.
100 gms. equi. mols. Quinoline and C_2H_5OH dissolve 36.55 + gm. Antipyrine at 20-25°.
(Pucher and Dehn. 1921.)

100 gms. Glycerol of $d = 1.2326$ dissolve 21.4 gms. Antipyrine at 20°. (Holm, 1921, 1922.)
100 gms. » » $d = 1.2645$ » 17.3 » » at 20°. » »
100 gms. Cymene » 2.09 » » at 30°. (Wheeler, 1920.)
100 gms. 86.5 % Glycerol ($d = 1.2326$) dissolve 1,9 gms. *Dimethyl amino antipyrine* and 100 gms. 98.5 % Glycerol ($d = 1.2645$) dissolve 1.5 gms. at 20°. (Holm, 1921, 1922.)

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given for mixtures of antipyrine an each of the following compounds :

Benzoic acid (4)	Hydroquinol (2) (3)	Pyrocatechol (2)
Carbazole (6)	α and β Naphthol (2)	Pyrogallol (2)
Diphenylamine (6)	β Naphthylamine (6)	Resorcinol (2)
Dimethyl glyoxime (1)	Phenol (2)	Salicylic acid (2)
Methyl glyoxime (1)	*o*, *m* and *p* Nitrophenol (2)	Thiosinamine (5)
Methyl ethyl glyoxime (1)	1.2.4 Dinitrophenol (2)	Phenyl Urethan (5)
	o Phenylenediamine (6)	Veronal (6)

(1) Semeria and Bocca, 1926; (2) Kremann and Haas, 1919; (3) Rheinboldt, Henning and Kircheisen, 1925; (4) Kremann and Marktl, 1920; (5) Mazetti, 1926; (6) Pfeiffer and Angern, 1926.

Data are also given by (6) for mixtures of Acetal amino antipyrine and Veronal

Freezing-point data for mixtures of *Apocholic acid* + Montan acid are given by Rheinboldt, 1926.

ARGON A.

Solubility in Water. (von Antropoff, 1919.)

The determinations were made with the highest accuracy possible. The manner of expressing the solubility of gases is discussed in detail. The author expresses his results in terms of the Bunsen coefficient as modified by Kuenen, that is in terms of the volume of gas in cc. (reduced to normal conditions) dissolved by *one gram* of solvent.

t°.	Coef. of absorption.	t°.	Coef. of absorption.
0.....	0.0578	30.....	0.0326
10.....	0.0452	40.....	0.0286
20.....	0.0374	50.....	0.0257

ARSENIC ACID $H_3AsO_4.{}^1/_2H_2O$

Solubility in Aqueous Solutions of Salts at 22°.

(Dhar, 1926.)

An excess of Arsenic acid was shaken with the aqueous solutions for 30 hrs.

Aqueous solution of :	Gm. equiv. of salt per liter.	Excess* of Arsenic acid in gm. équiv. per liter.	Dissociation constant.
Sodium Benzoate C_6H_5COONa.....	0.0283	0.0017	$0.6.10^{-6}$
» » »	0.0565	0.0038	$0.3.10^{-6}$
» » »	0.1130	0.0062	$0.7.10^{-6}$
Sodium Acetate CH_3COONa.....	0.0475	0.0050	$0.5.10^{-6}$
» » »	0.0950	0,0073	$0.1.10^{-6}$
» » »	0.1900	0.0015	$0.3.10^{-6}$
Sodium Butyrate C_3H_7COONa.....	0.0375	0.0009	$0.3.10^{-5}$
» » »	0.0750	0.0030	$0.1.10^{-5}$
» » »	0.1500	0.0102	$0.3.10^{-6}$

* This probably refers to the excess of arsenic acid above that dissolved by water alone. Although the author mentions that determinations of the solubility in water were made, the results are not given.

ARSENIOUS ACID.

Solubility of Arsenious Acid in Glycerol at 20°.

(Holm, 1921, 1922.)

Solvent.	Gms. Arsenious acid per 100 gms. Glycerol. Sat. approached from below.	Sat. approached from above.
Glycerol of $d = 1.2326$.....	19.5	25.7
» » $d = 1.2645$.....	35.4	43,5

Although 20 weeks were allowed for the attainment of equilibrium, agreement between the results obtained by approaching saturation from below and from above was not reached.

ARSENIC TRIOXIDE As_2O_3.

SOLUBILITY IN WATER. (Anderson and Story, 1923.)

The mixtures were constantly agitated in a thermostat, and saturation was approached from above. Periods of 10 days to 2 weeks were required for the attainment of equilibrium. The As_2O_3 was determined by titration with standard iodine solution.

t°.	Gms. As_2O_3 per 100 gms. H_2O.	t°.	Gms. As_2O_3 per 100 gms. H_2O.	t°.	Gms. As_2O_3 per 100 gms. H_2O.	t°.	Gms. As_2O_3 per 100 gms. H_2O.
0.....	1.21	25.....	2.05	48.2...	3.43	75.....	5.62
15.....	1.66	39.8. .	2.93	62.....	4.45	98.5...	8.18

ARSENIC TRIBROMIDE, TRICHLORIDE, etc., $AsBr_3$, $AsCl_3$.

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given for the following systems :

$AsBr_3$ + α Naphthol (Puschin and Löwy, 1926.)
» + Phenol » » »
» + Resorcinol » » »
» + Ethyl urethan » » »
$AsCl_3$ + Chlorine (Biltz and Meinecke, 1923.)
$As I_3$ + Stannic iodide (Vasilev, 1917.)
As_2O_3 + Thallium sulfide (Canneri and Fernandez, 1925.)

$As S(C_6H_5)_3$ + Triphenyl phosphine oxide
» + » phosphine sulfide
» + » arsine oxide
$As O(C_6H_5)_3$ + » phosphine sulfide
» + » phosphine oxide

(Pascal, 1923.)

l ASPARIGINE $HOOC.CH_2CH(NH_2).CO.NH_2$.

100 cc. sat. solution of Asparigine in Water contain 1.12 gm. $C_4H_8N_2O_3$ at 21-22° (Pfeiffer and Angern, 1924.)
100 gms. abs. Alcohol dissolve 0.02 gm. Asparigine at 20–25° (Pucher and Dehn, 1921.)
» Quinoline » 0.11 » » » » » »
» equi. mol. mixture of Alcohol and Quinoline dissolve 0.18 gm. Asparigine at 20–25° (Pucher and Dehn, 1921.)

l ASPARTIC ACID (Aspariginic Acid) Amino Succinic Acid, $HOOC.CH_2.CH.NH_2.COOH$.

SOLUBILITY IN WATER AND IN AQUEOUS SOLUTIONS OF SALTS AT 20°.
(Pfeiffer and Würgler, 1916.)

Salt.	Mols. salt per liter.	Gms. $C_4H_7NO_4$ per 100 cc. sat. sol.	Salt.	Mols. salt per liter.	Gms. $C_4H_7NO_4$ per 100 cc. sat. sol.
None (= H_2O)..	0.00	0.410	$BaCl_2$.....	0.500	0.691
LiCl.....	1.17	0.493	$CaCl_2$.....	0.429	0.612
KNO_3.....	1.00	0.633	»	0.528	0.638
KCl.....	1.00	0.540	»	0.858	0.745
KBr.....	0.50	0.499	»	1.716	0.998
»	1.00	0.550	$Ca(NO_3)_2$.....	0.49	0.758
»	2.00	0.638	$SrBr_2$.....	0.486	0.638
»	4.00	0.742	$SrCl_2$.....	0.500	0.638
K_2SO_4..	0.50	0.686	$Sr(NO_3)_2$.....	0.204	0.592
NaCl.....	0.50	0.464	»	0.408	0.751
»	1.00	0.520	»	0.500	0.798
»	2.00	0.541	»	0.816	0.929
»	4.00	0.570	»	1.632	1.346

The following determinations are given for salt solutions made with aqueous 0.1 normal Na OH instead of water.

Salt.	Mols. salt per liter.	Gms. $C_4H_7NO_4$ per 100 cc. sat. sol.	Salt.	Mols. salt per liter.	Gms. $C_4H_7NO_4$ per 100 cc. sat. sol.
None (=0.1*n* NaOH).	0.0	1.669	KBr.....	2.0	1.762
LiCl.....	1.97	1.640	KCl.....	2.0	1 756
NaCl.....	2.00	1.707	KNO_3.....	2.0	1.907

ASPIRIN (Acetyl Salicylic Acid) $C_6H_4(OCH_3CO)COOH$.

100 gms. sat. sol. in water contain 0.577 gms. aspirin at 14° (Oliveri-Mandala, 1926.)
» 9.98 % solution of antipyrine contain 1.238 gms. aspirin at 14° (Oliveri-Mandala, 1926.)

ATOPHAN (Cinchophen) Phenylcinchoninic Acid (2) $(C_6H_5).C_9H_6N.(4)COOH$.

Solubility in Several Solvents at 25°. (Leech, Rabak and Clark, 1919.)

Solvent.	Gms. Atophan per 100 gms. sat. sol.
Water	0.0160
95 % Ethyl alcohol	0.8343
48.5 % »	0.0875
Chloroform	0.1075
Ethyl acetate (81.6 %) + alcohol, etc. (10 %)	1.4151

ATROPINE $C_{17}H_{23}NO_3$.

Solubility in Water at 18°. (Kolthoff, 1925.)

The aqueous solution of atropine is very unstable. The compound saponifies to tropin and tropaic acid. The solubility diminishes greatly on long shaking. The author obtained constant values after 1 to 2 hours shaking. The saturated solution was filtered and 25 cc. titrated with 0.01 *n* HCl using methyl red as indicator. The results correspond to a solubility of $5.5.10^{-3}$ mol. or 1.59 gm. per liter. The dissociation constant was determined by colorimetric p_H estimations in 5 cc. portions of a 0.01 mol. $C_{17}H_{23}NO_3.HCl$ solution to which increasing amounts of 0.01 *n* NaOH were added. The calculated constant $K = 4.5.10^{-5}$.

AZOBENZENE $C_6H_5.N_2.C_6H_5$.

Solubility of Azobenzene in Several Solvents.

Solvent.	t°.	Gms. $C_6H_5.N_2.C_6H_5$ per 100 gms. solvent.	Authority.
Amyl acetate	25	44.1	(Kröber, 1919.)
Methyl butyrate	25	62.2	»
Methyl formate	25	46.6	»
Carbon tetrachloride	20	2.83	(Pawlewski, 1914.)
Chloroform	20	16.24	»
Ethyl alcohol (abs.)	20–25	9.25	(Pucher and Dehn, 1921.)
Equi. mol. Mixture of Ethyl alcohol+Quinoline.	20–25	22.9	»

Solubility of Azobenzene in Rubber. (Bruni, 1921.)

Mixtures of azobenzene and rubber were heated untill homogeneous and then cooled to incipient crystallization.

t° of cryst.	Gms. $C_6H_5N_2C_6H_5$ per 100 gms. mixture.	t° of cryst.	Gms. $C_6H_5N_2C_6H_5$ per 100 gms. mixture.	t° of cryst.	Gms $C_6H_5N_2C_6H_5$ per 100 gms. mixture.
69.0	100.0	67.2	80.0	59.2	50.0
68.95	98.0	66.2	75.0	52.1	40.0
68.6	95.0	65.7	70.0	43.4	30.0
68.6	90.0	63.1	60.0		

Data for the distribution of azobenzene between hexane and methylalcohol are given by Perschke, 1926.

Freezing-point lowering data are given by Kremann, Zechner and Weber, 1924, for mixtures of azobenzene and each of the following compounds : α and β naphthol, pyrocatechol, resorcinol, hydroquinol, pyrogallol, *o*, *m* and *p* nitrophenol, 1.2.4 dinitrophenol, and picric acid. Similar results are given by Kremann and Zechner, 1925, for mixtures of azobenzene and benzoic, salicylic cinnamic and succinic acids. Results for mixtures of azobenzene and diphenyl amine are given by Giua and Cherchi, 1919. Results are given by Giua and Reggiani, 1925, for mixtures of azobenzene and each of the following compounds : α trinitrotoluene, 2.4 dinitrotoluene, *p* mononitrotoluene and *m* dinitrobenzene. They also give similar data for mixtures containing *p* aminoazobenzene, dimethyl *p* aminoazobenzene and azoxybenzene. Results for aminoazobenzene +α trinitrotoluene are given by Giua and Angelliti, 1920.

BARIUM β Methyl **ADIPATE** (Racemic).

100 gms. sat. solution in water contain 27.6 gms. of the salt at 20° (Meurisse.)

BARIUM ARSENATES $BaHAsO_4.H_2O$, $BaH_4(AsO_4)_2.H_2O$.

EQUILIBRIUM IN THE SYSTEM BARIUM OXIDE, ARSENIC PENTOXIDE AND WATER AT 30°. (Hendricks, 1926.)

The bottles containing the mixtures were kept at constant temperature and the solutions analyzed at intervals of one week. The composition of the solid phase was determined by the method of Schreinemakers, and by observation under the microscope.

d_{20} of. sat. solution.	Gms. per 100 gms. sat. sol. BaO.	Gms. per 100 gms. sat. sol. As_2O_5.	Mol. ratio in solution.	Solid Phase.
1.003	0.22	0.002	136.8	Probably solid solution
1.002	0.11	0.003	57.3	»
1.001	0.02–0.03	0.29–0.034	0.93–1.37	$BaHAsO_4.H_2O + Ba_3(AsO_4)_2.xH_2O$
1.067	2.63	3.98	0.99	$BaHAsO_4.H_2O$
1.094	3.60	5.86	0.92	»
1.117	4.36	7.26	0.90	»
1.108	4.04	6.72	0.90	»
1.151	5.49	9.28	0.89	»
1.176	6.25	10.56	0.89	»
1.188	6.62	11.27	0.88	»
1.281	6.98	11.12	0.94	»
1.271	9.46	14.92	0.95	»
1.357	11.67	18.52	0.94	»
1.474	13.59	22.95	0.90	»
1.592	15.37	27.26	0.85	»
–	16.65	28.01	–	$» + BaH_4(AsO_4)_2.2H_2O$
1.694	15.65	31.17	0.75	$BaH_4(AsO_4)_2.2H_2O$
1.719	13.35	35.87	0.56	»
1.809	7.53	47.27	0.24	»
1.817	6.56	48.48	0.20	»
2.150	trace	68.40	–	»
2.280	»	72.04	–	$» + 3As_2O_5.5H_2O$
1.869	»	59.44	–	$3As_2O_5.5H_2O$

Data for equilibrium in the system barium oxide, arsenic trioxide and water at 25° and at 50° are given by Story and Anderson, 1924.

BARIUM BENZOATE $(C_6H_5COO)_2Ba.2H_2O$.

BARIUM Oxy**BENZOATE**, etc.

SOLUBILITY OF EACH IN WATER AT 20°. (Ephraim and Pfister, 1925.)

Compound.	Formula.	Gms. anhydrous compound per 100 cc. sat. sol.
Barium Benzoate.....	$(C_6H_5COO)_2Ba.2H_2O$	4.955
» 4 Chlor Benzoate..	$(C_7H_4O_2Cl)_2Ba.H_2O$	0.109
» 4 Oxy » ..	$(C_7H_5O_3)_2Ba.2H_2O$	0.367
» 4 Methoxy » ..	$(C_8H_7O_3)_2Ba.H_2O$	0.0752
» 4 Nitro » ..	$(C_7H_4O_4N)_2Ba$	0.127

BARIUM BROMIDE $BaBr_2.2H_2O$.

SOLUBILITY IN WATER. (Milikan, 1917.)

t°	Gms. $BaBr_2$ per 100 gms. sat. sol.	Solid Phase.	t°	Gms. $BaBr_2$ per 100 gms. sat. sol.	Solid Phase.
– 3.9..	17.8	Ice	20...	51.0	$BaBr_2.2H_2O$ (Kremers)
–14.1..	38.2	»	40...	53.5	» »
–21.1..	44.6	»	60...	55.2	» »
–22.6..	46.6	$» + BaBr_2.2H_2O$	80...	57.4	» »
0.0..	49.5	$BaBr_2.2H_2O$ (Kremers)	100...	59.8	» »

SOLUBILITY OF BARIUM BROMIDE IN AQUEOUS SOLUTIONS OF BARIUM HYDROXIDE AND VICE VERSA AT 25°. (Millikan, 1917.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
BaO.	$BaBr_2$.	Solid Phase.	BaO.	$BaBr_2$.	Solid Phase.
0.0	51.10	$BaBr_2.2H_2O$	3.71	36.41	$BaBr_2.BaO.5H_2O + BaO.9H_2O$
0.78	50.67	»	3.46	27.91	$BaO.9H_2O$
0.79	50.65	» + $BaBr_2.BaO.5H_2O$	3.48	25.03	»
0.91	49.30	$BaBr_2.BaO.5H_2O$	3.41	18.42	»
2.15	41.71	»	3.53	13.45	»
2.42	40.47	»	4.05	0.0	»

SOLUBILITY OF BARIUM BROMIDE IN AQUEOUS SOLUTIONS OF HYDROBROMIC ACID AT 18°. (Chlopin, 1925.)

Gms. per 100 cc. sat. sol.		Gms. per 100 cc. sat. sol.	
HBr.	$BaBr_2$.	HBr.	$BaBr_2$.
0.0	86.67	14.858	33.93
8.915	52.29	21.026	13.36
11.742	45.73	25.231	8.91
13.421	40.79	33.521	2.37

SOLUBILITY OF BARIUM BROMIDE IN ABSOLUTE ETHYL ALCOHOL. (Bonnell and Jones, 1926.)

NOTE. — The mixtures were shaken by hand at intervals during a long period of time. Equilibrium was approached from above in some cases. The solutions were analyzed repeatedly untill constant results were obtained. Temperatures constant to 0.02°.

t°.	Gms. $BaBr_2$ per 100 gms. C_2H_5OH.	t°.	Gms. $BaBr_2$ per 100 gms. C_2H_5OH.	t°.	Gms. $BaBr_2$ per 100 gms. C_2H_5OH.
0.....	5.88	20.....	4.130	50.....	1.837
10.....	5.067	30.....	3.322	60.....	1.479
15.....	4.590	40.....	2.433	70.....	1.253

Freezing-point lowering data are given by Kellner, 1917 for mixtures of $BaBr_2$ + LiBr, $BaBr_2$ + KBr and $BaBr_2$ + NaBr.

BARIUM CARBONATE $BaCO_3$.

SOLUBILITY IN WATER SATURATED WITH CARBON DIOXIDE AT A PRESSURE OF ONE ATMOSPHERE AND OF TWENTY-FIVE ATMOSPHERES AT 18°. (Hachnel, 1924.)

The flask containing the mixture was placed inside an autoclave which was shaken from time to time. By inverting the autoclave the saturated solution was filtered through a thimble into a receiver. Thus the entire operation was conducted at the desired pressure of carbon dioxide.

	Gms. per 100 gms. sat. sol.	
Pressure of Carbon Dioxide.	Carbonate.	Bicarbonate.
1.0 atmosphere.....	0.27	0.37
25.0 atmospheres.....	0.59	0.79

The limit of solubility at 18° was at 25 atmospheres pressure of CO_2.

SIMULTANEOUS SOLUBILITY OF BARIUM CARBONATE AND SULFATE IN AQUEOUS SOLUTIONS OF POTASSIUM SALTS. (Ramann and Sallinger, 1921.)

Barium chloride solutions were added to various mixtures of K_2CO_3 and K_2SO_4 dissolved in water, and the distribution of barium between CO_3 and SO_4 determined at various temperatures and after various lengths of time.

Data for solubility of barium carbonate in aqueous hydroxylamine solutions are given by Hahn and Brunngässer, 1926.

BARIUM PerCHLORATE $Ba(ClO_4)_2$.

SOLUBILITY OF ANHYDROUS BARIUM PERCHLORATE IN WATER AND IN SEVERAL ANHYDROUS SOLVENTS AT 20°. (Willard and Smith, 1923.)

Solvent.	$d_{\frac{25}{4}}$ of solvent.	$d_{\frac{25}{4}}$ of sat. sol.	Gms. $Ba(ClO_4)_2$ per 100 gms. sat. sol.	Solvent.	$d_{\frac{25}{4}}$ of solvent.	$d_{\frac{25}{4}}$ of sat. sol.	Gms. $Ba(ClO_4)_2$ per 100 gms. sat. sol.
Water.....	–	1.9403	66.48	*n* Butyl alcohol...	0.8059	1.1342	36.78
Methyl alcohol...	0.78705	1.7507	68.46	*iso* Butyl alcohol.	0.7981	1.1171	35.99
Ethyl alcohol....	0.78517	1.4157	55.48	Acetone	0.7852	1.4607	55.49
n Propyl alcohol.	0.7989	1.2145	43.07	Ethyl acetate....	0.8923	1.5236	53.04

BARIUM CHLORIDE $BaCl_2.2H_2O$.

SOLUBILITY OF BARIUM CHLORIDE AT 20° IN AQUEOUS SOLUTIONS OF : (Findlay and Cruickshank, 1926.)

Barium Nitrate.

Gms. per 100 gms. sat. sol. $Ba(NO_3)_2$.	Gms. per 100 gms. sat. sol. $BaCl_2$.	Solid Phase.
0.0	26.32	$BaCl_2.2H_2O$
1.31	26.07	»
6.93	25.09	» + $Ba(NO_3)_2$
6.54	20.81	$Ba(NO_3)_2$
6.72	12.31	»
7.17	7.51	»
8.41	0.00	»

Sodium Chloride.

Gms. per 100 gms. sat. sol. NaCl.	Gms. per 100 gms. sat. sol. $BaCl_2$.	Solid Phase.
7.80	16.89	$BaCl_2.2H_2O$
9.54	14.99	»
14.50	10.04	»
18.52	6.51	»
21.23	4.17	»
24.59	3.07	» + NaCl
25.28	1.65	NaCl

The following data for quarternary solutions are also given.

Gms. per 100 gms. sat. solution. NaCl.	$NaNO_3$.	$Ba(NO_3)_2$.	$BaCl_2$.	Solid Phase.
6.57	37.82	1.62	–	$NaNO_3 + Ba(NO_3)_2$
15.79	24.08	0.14	–	$NaCl + Ba(NO_3)_2$
2.02	–	6.49	22.66	$BaCl_2.2H_2O + Ba(NO_3)_2$
14.23	29.75	0.13	–	$NaCl + NaNO_3 + Ba(NO_3)_2$
*24.16	0.50	7.14	–	$BaCl_2.2H_2O + NaCl + Ba(NO_3)_2$

* This solution is incongruently saturated.

SOLUBILITY OF BARIUM CHLORIDE IN AQUEOUS SOLUTIONS OF COBALT CHLORIDE AT 20°. (Mazzetti, 1926.)

Gms. per 100 gms. sat. sol. $CoCl_2$.	Gms. per 100 gms. sat. sol. $BaCl_2$.	Solid Phase.
6.34	16.50	$BaCl_2.2H_2O$
13.14	10.03	»
19.52	5.48	»
24.92	2.01	»
29.57	0.88	$BaCl_2.2H_2O$
33.80	0.38	»
34.15	0.37	»
34.43	0.45	» + $CoCl_2.6H_2O$

EQUILIBRIUM IN THE SYSTEM BARIUM OXIDE, HYDROCHLORIC ACID AND WATER AT 30°. (Millikan, 1918.)

Gms. per 100 gms. sat. sol. HCl.	BaO.	Solid Phase.
0.0	4.99	$BaO.9H_2O$
3.77	12.38	»
4.49	14.01	»
6.32	17.90	»
6.34	17.98	» + $BaCl_2.BaO.5H_2O$
6.57	18.40	» »
6.72	18.79	$BaCl_2.BaO.5H_2O$
7.51	19.07	»
8.47	20.32	»
8.75	20.72	»
9.58	21.90	$BaCl_2.BaO.5H_2O + BaCl_2.2H_2O$
9.60	21.97	$BaCl_2.2H_2O$
9.66	20.32	»
9.66	18.21	»
10.48	9.55	»
12.90	2.83	»
18.27	0.16	»
32.35	0.0	»
37.34	0.0	» + $BaCl_2.H_2O$
38.63	0.0	$BaCl_2.H_2O$

SOLUBILITY OF BARIUM CHLORIDE IN SELENIUM OXYCHLORIDE ($SeOCl_2$). (Wise, 1928.)

t°.	25°.	40°.	55°.	70°.
Gms. $BaCl_2$ per 100 gms. sat. sol.	3.95	2.35	1.23	0.71

INFLUENCE OF WATER UPON THE SOLUBILITY OF BARIUM CHLORIDE IN SELENIUM OXYCHLORIDE AT 25°.

Moles H_2O per mol. $SeOCl_2$	0.0	0.0625	0.125	0.25	0.5	1.0
Gms. $BaCl_2$ per 100 gms. sat. sol.	3.95	3.86	3.37	2.32	1.40	0.45

Freezing-point lowering data are given by Valentin, 1922, and Matignon and Valentin, 1923, for mixtures of $BaCl_2 + MgCl_2 + KCl$. Results for mixtures of $BaCl_2 + SrCl_2 + CaCl_2$ are given by Schaeffer, 1919.

BARIUM CHROMATE $BaCrO_4$.

APPROXIMATE SOLUBILITY OF BARIUM CHROMATE IN AQUEOUS SALT-SOLUTIONS. (Waddell, 1918.)

Freshly precipitated barium chromate was successively washed on a 11 cm. filter paper with 100 cc. portions of water and of various salt solutions. The dissolved chromate in the washings was determined by a new method of titration proposed by the author. The results do not show the maximum solubility but only the relative solubility under ordinary conditions of washing.

Solvent.	Gms. $BaCrO_4$ per 100.000 cc. wash solution.	Solvent.	Gms. $BaCrO_4$ per 100.000 cc. wash solution.
Water	0.78	10.0 % aq. Am. nitrate	4.89
1.0 % aq. Am. acetate	2.80	10.0 » » Pot. »	1.78
10.0 » » » »	3.58	19.0 » » Sod. chloride	2.39
20.0 » » » »	5.07	1.0 » » Acetic acid	11.04
10.0 » » » »+10% acetic ac.	8.77		

BARIUM CINNAMATE $C_{18}H_{14}O_4Ba.2H_2O$.

100 cc. sat. solution in water contain 0.0444 gm. $C_{18}H_{14}O_4Ba$ at 20°. (Ephraim and Pfister, 1926.)

BARIUM SilicoFLUORIDE $BaSiF_6$.

100 gms. of a saturated solution in a solvent composed of 500 cc. H_2O + 30 cc. 1.0 *n* HCl + 5 gms. $(NH_4)_2SiF_6$ contain 0.013 gm. $BaSiF_6$ at 18.5°.

100 gms. of a sat. solution in a solvent composed of 270 cc. H_2O + 15 cc. 1.0 *n* HCl + 2.5 gm. $(NH_4)_2SiF_6$ + 95 cc. C_2H_5OH contain 0.0082 gm. $BaSiF_6$ at 18.5°. (Leo, 1923.)

BARIUM HELIANTHATE $(C_{14}H_{14}N_3SO_3)_2Ba.4H_2O$.

1000 gms. H_2O dissolve 0.201 gm. Barium Helianthate at 20-25°. (Stark and Dehn, 1918.)

BARIUM HYDROXIDE $Ba(OH)_2.8H_2O$.

RECIPROCAL SOLUBILITY OF BARIUM HYDROXIDE AND BARIUM SULFHYDRATE IN WATER AT VARIOUS TEMPERATURES. (Terres and Brückner, 1920.)

t°.	Gms. per 100 gms. sat. sol. $Ba(OH)_2$.	Gms. per 100 gms. sat. sol. $Ba(SH)_2$.	t°.	Gms. per 100 gms. sat. sol. $Ba(OH)_2$.	Gms. per 100 gms. sat. sol. $Ba(SH)_2$.	t°.	Gms. per 100 gms. sat. sol. $Ba(OH)_2$.	Gms. per 100 gms. sat. sol. $Ba(SH)_2$.	t°.	Gms. per 100 gms. sat. sol. $Ba(OH)_2$.	Gms. per 100 gms. sat. sol. $Ba(SH)_2$.
0...	1.49	0.92	20...	1.95	17.1	60...	12.9	1.15	80...	4.6	25.0
0...	0.88	5.45	20...	1.1	26.2	60...	11.0	7.82	80...	4.0	30.0
0...	0.6	13.6	20...	1.0	29.0	60...	8.0	10.03	80...	4.2	31.4
0...	0.6	19.6	20...	0.9	30.0	60...	5.38	12.25	80...	3.7	34.95
0...	0.65	26.3	20...	1.18	32.8	60...	3.0	19.9	80...	2.05	39.0
0...	0.69	22.5	40...	4.65	4.5	60...	2.56	27.0	100...	41.9	1.32
0...	0.65	27.8	40...	3.8	9.55	60...	2.52	28.8	100...	30.5	7.1
0...	0.70	28.6	40...	1.9	15.3	60...	2.13	33.0	100...	29.5	7.6
0...	0.60	29.0	40...	1.5	20.4	60...	2.10	33.5	100...	27.3	11.9
0...	0.96	32.6	40...	1.5	27.5	60...	2.07	37.2	100...	24.4	13.0
20...	3.0	4.87	40...	1.65	17.6	80...	22.3	1.81	100...	5.8	35.2
20...	2.85	6.20	40...	1.44	20.7	80...	19.0	5.55	100...	5.0	41.8
20...	1.03	15.60	40...	1.39	25.1	80...	18.5	9.6	100...	1.96	43.7
20...	1.08	17.90	40...	1.32	30.6	80...	9.0	12.4			
20...	1.00	29.00	40...	1.29	35.2	80...	6.0	21.0			

See Note, next page.

NOTE. — The results given at the bottom of the preceding page, when plotted on cross section paper, yield curves composed of three branches. The central branch of each curve corresponds to the double salt $Ba(OH)_2.Ba(SH)_2.10H_2O$.

SOLUBILITY OF BARIUM HYDROXIDE IN AQUEOUS SOLUTIONS OF PHENOL AND VICE VERSA AT 25°. (Van Meurs, 1916.)

Mols. per 100 mols. sat. sol.			Mols. per 100 mols. sat. sol.		
C_6H_5OH.	$\frac{Ba(OH)_2}{2}$.	Solid Phase.	C_6H_5OH.	$\frac{Ba(OH)_2}{2}$.	Solid Phase.
0.0	0.99	$Ba(OH)_2.8H_2O$	14.44	5.89	$(C_6H_5O)_2Ba.4H_2O$
0.76	1.54	»	19.25	6.70	»
1.48	2.19	»	33.57	7.53	»
2.51	3.09	»	50.25	7.06	»
3.06	3.63	$» + (C_6H_5O)_2Ba.4H_2O$	69.61	4.98	»
3.17	3.29	$(C_6H_5O)_2Ba.4H_2O$	70.74	5.04	»
4.78	3.67	»	70.36	4.94	»
12.03	5.44	»	73.48	3.28	»

Two liquid layers are formed at concentrations of $Ba(OH)_2$ less than 0.56 mol. %.

Aqueous layer.		Phenol layer.	
Mol. % C_6H_5OH.	Mol. % $\frac{Ba(OH)_2}{2}$.	Mol. % C_6H_5OH.	Mol. % $\frac{Ba(OH)_2}{2}$.
1.79	0.0	32.33	0.0
1.89	0.05	28.84	0.12
2.48	0.20	19.82	0.47
3.70	0.30	14.46	0.56

SOLUBILITY OF BARIUM HYDROXIDE IN AQUEOUS SOLUTIONS OF RESORCINOL AND VICE VERSA AT 30°. (Van Meurs, 1916.)

Mols. per 100 mols. sat. sol.			Mols. per 100 mols. sat. sol.		
$\frac{C_6H_4(OH)_2}{2}$.	$\frac{Ba(OH)_2}{2}$.	Solid Phase.	$\frac{C_6H_4(OH)_2}{2}$.	$\frac{Ba(OH)_2}{2}$.	Solid Phase.
0.0	1.17	$Ba(OH)_2.8H_2O$	18.00	14.45	$C_6H_4O_2Ba.2H_2O$
2.45	3.42	»	20.44	14.21	»
4.37	5.29	»	47.75	10.42	$C_6H_4(OH)_2$
5.77	6.62	»	43.63	6.86	»
9.40	10.38	»	40.71	3.30	»
13.96	14.56	$» + C_6H_4O_2Ba.2H_2O$			

BARIUM SulfHYDRATE $Ba(SH_2).4H_2O$.

SOLUBILITY IN WATER. (Terres and Brückner, 1920.)

t°.	Gms. $Ba(SH_2)$ per 100 gms. sat. sol.	t°.	Gms. $Ba(SH)_2$ per 100 gms. sat. sol.
—15.....	32.0	60.....	36.2
0.....	32.6	80.....	39.0
20.....	32.8	100.....	43.7
40.....	34.5		

BARIUM IODIDE $BaI_2.2H_2O$.

EQUILIBRIUM IN THE SYSTEM $BaI_2 + BaO + H_2O$ AT 25°. (Millikan, 1917.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
BaO.	BaI_2.	Solid phase.	BaO.	BaI_2.	Solid Phase.
0.0	68.59	$BaI_2.2H_2O$	1.67	49.85	$BaI_2.BaO.9H_2O$
0.24	68.52	$» + BaI_2.BaO.9H_2O$	3.14	44.99	$» + BaO.9H_2O$
0.36	62.76	$BaI_2.BaO.9H_2O$	3.08	42.28	$BaO.9H_2O$
0.40	60.33	»	3.00	32.92	»
0.64	56.77	»	3.01	28.43	»
1.04	53.68	»	3.25	18.38	»
1.25	52.39	»	4.05	0.0	»

Solubility of Barium Iodide in Water. (Packer and Rivett, 1926.)

t°.	$d\frac{t°}{4}$ of sat. sol.	Gms. BaI_2 per 100 gms. sat. sol.	Solid Phase.	t°.	$d\frac{t°}{4}$ of sat. sol.	Gms. BaI_2 per 100 gms. sat. sol.	Solid Phase.
− 1.0...	1.060	7.00	Ice	−5.8..	2.036	61.45	$2BaI_2.15H_2O$
− 1.7...	1.117	12.4	»	0.0..	2.071	62.5	»
− 3.7...	1.221	21.35	»	+5.0..	2.105	63.6	»
− 5.35..	1.281	26.05	»	10.0..	2.144	64.8	»
− 7.75..	1.371	32.05	»	15.0..	2.176	65.75	»
− 9.35..	1.423	35.15	»	19.9..	2.222	67.15	»
−12.35..	1.507	39.90	»	25.0..	2.277	68.8	»
−14.95..	1.568	42.95	»	25.7..	–	68.9	»+$BaI_2.2H_2O$
−18.15..	1.634	46.1	»	26.0..	2.282	68.9	$BaI_2.2H_2O$
−22.9...	1.731	50.4	»	30.0..	2.287	64.1	»
−24.6...	1.764	51.5	»	40.0..	2.304	69.6	»
−30.2...	1.842	54.6	»	50.0..	2.32	70.1	»
−33.5...	–	56.0	»+$2BaI_2.15H_2O$	60.0..	2.331	70.7	»
−29.75..	1.905	56.8	$2BaI_2.15HO$	69.5..	2.35	71.15	»
−25.4...	1.927	57.5	»	87.7..	–	72.55	»
−20.0...	1.952	58.6	»	98.9..	–	73.35	»+$BaI_2.H_2O$
−15.4...	1.983	59.65	»	110.0..	–	74.0	$BaI_2.H_2O$
− 9.7...	2.012	60.65	»	120.0..	–	74.3	»

Solubility of Barium Iodide in Absolute Ethyl Alcohol.
(Bonnell and Jones, 1926.) (See Note p. 1076).

t°.	Gms. BaI_2 per 100 gms. C_2H_5OH.	t°.	Gms. BaI_2 per 100 gms. C_2H_5OH.
0.....	77.75	40.....	76.20
10.....	77.35	50.....	75.85
20.....	77.00	60.....	75.50
30.....	76.60	70.....	75.10

100 cc. pyridine dissolve 8.22 gms. BaI_2 at 25°. (Müller, 1924.)

BARIUM MALATE $C_4H_4O_5Ba$.

Solubility of Active and Racemic Barium Malate in Water.
(Duboux and Cuttat, 1921.)

Results for the Active Salt.

t°.	Gms. $C_4H_4O_5Ba$ per 100 gms. sat. sol.	Solid Phase.
0.0...	1.020	$C_4H_4O_5Ba$
12.5...	1.150	»
25.0...	1.240	»
37.5...	1.310	»

Results for the Racemic Salt.

t°.	Gms. $C_4H_4O_5Ba$ per 100 gms. sat. sol.	Solid Phase.
0.....	0.76	$C_8H_8O_{10}.Ba_2.H_2O$
– ...	–	–
25.0...	0.58	»
37.5...	0.84	»

BARIUM NITRATE $Ba(NO_3)_2$.

Solubility of Mixtures of Barium Nitrate and Lead Nitrate in Water at 25° and at 50°. (Glasstone and Riggs, 1925.)

t°.	Gms. per 100 gms. sat. sol. $Pb(NO_3)_2$.	Gms. per 100 gms. sat. sol. $Ba(NO_3)_2$.	% $Pb(NO_3)_2$ in Solid Phase.	t°.	Gms. per 100 gms. sat. sol. $Pb(NO_3)_2$.	Gms. per 100 gms. sat. sol. $Ba(NO_3)_2$.	% $Pb(NO_3)_2$ in Solid Phase.
25....	1.63	8.64	3.59	50....	5.72	12.68	6.67
»	6.26	7.31	10.42	»	10.34	11.05	8.78
»	8 96	6.66	15.44	»	17.05	9.12	–
»	16.21	5.29	–	»	29.31	6.32	41.25
»	22.73	4.23	39.27	»	37.78	3.83	69.02
»	31.13	2.65	76.56	»	40.82	2.57	88.31
»	34.60	1.39	87.54				

The solid phase consists of mixed crystals in all cases.

Solubility of Barium Nitrate in Aqueous Solutions of Nitric Acid at 15°.

(Chlopin, 1925.)

Gms. per 100 cc. sat. sol.		Gms. per 100 cc. sat. sol.		Gms. per 100 cc. sat. sol.	
HNO_3.	$Ba(NO_3)_2$.	HNO_3.	$Ba(NO_3)_2$.	HNO_3.	$Ba(NO_3)_2$.
0.0	8.03	2.23	5.63	10.07	2.07
1.16	6.25	4.30	4.23	18.39	1.15

Note. — A mistake was made in calculating the results of Masson given at the top of page 117 of the preceding volume of «Solubilities». The table should be as follows.

Solubility of Barium Nitrate in Aqueous Solution of Nitric Acid at 30°.

(Masson, 1911.)

$d_{\frac{30}{4}}$ of sat. sol.	Gms. per 100 cc. sat. sol.		$d_{\frac{30}{4}}$ of sat. sol.	Gms. per 100 cc. sat. sol.	
	HNO_3.	$Ba(NO_3)_2$.		HNO_3.	$Ba(NO_3)_2$.
1.0891	0.0	11.16	1.0633	7.854	2.76
1.0811	0.8303	9.624	1.0668	9.840	2.215
–	1.572	8.542	1.0783	12.59	1.563
1.0663	3.149	6.300	1.1050	18.86	0.873
1.0619	4.718	4.665	1.1341	25.16	0.576
1.0609	6.3	3.536	1.1645	31.57	0.384

Solubility of Barium Nitrate in Aqueous Solutions of Potassium Nitrate and Vice Versa at 25° and at 50°.

(Glasstone and Riggs, 1925.)

	Gms. per 100 gms. sat. sol.				Gms. per 100 gms. sat. sol.		
t°.	KNO_3.	$Ba(NO_3)_2$.	Solid Phase.	t°.	KNO_3.	$Ba(NO_3)_2$.	Solid Phase.
25.	0.00	9.28	$Ba(NO_3)_2$	50.	18.76	10.14	$Ba(NO_3)_2$
»	3.80	7.72	»	»	24.14	10.43	»
»	9.13	6.57	»	»	28.86	10.81	»+$2KNO_3.Ba(NO_3)_2$
»	14.8	6.6	»+$2KNO_3.Ba(NO_3)_2$	»	30.08	10.16	$2KNO_3.Ba(NO_3)_2$
»	17.14	4.88	$2KNO_3.Ba(NO_3)_2$	»	35.75	6.99	»
»	27.67	2.44	»+KNO_3	»	40.31	5.64	»
»	27.39	0.0	KNO_3	»	44.66	5.11	»+KNO_3
50.	0.0	14.63	$Ba(NO_3)_2$	»	44.88	4.22	KNO_3
»	3.93	12.73	»	»	45.45	2.34	»
»	10.53	10.92	»				

Solubility of Barium Nitrate in Aqueous Solutions of Silver Nitrate at 30° and Vice Versa. (de Baat, 1918.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$AgNO_3$.	$Ba(NO_3)_2$.	Solid Phase.	$AgNO_3$.	$Ba(NO_3)_2$.	Solid Phase.
0.0	10.4	$Ba(NO_3)_2$	44.11	4.57	$Ba(NO_3)_2$
8.07	7.36	»	61.87	3.58	»
20.69	5.77	»	71.62	2.57	»+$AgNO_3$
26.17	5.05	»	73.06	0.68	$AgNO_3$
41.39	4.69	»	73.00	0.0	»

Solubility of Barium Nitrate in Aqueous Solutions of Sodium Nitrate at 20°. (Findlay and Cruickshanks, 1926.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$NaNO_3$.	$BaNO_3$.	Solid Phase.	$NaNO_3$.	$BaNO_3$.	Solid Phase.
5.61	3.89	$Ba(NO_3)_2$	37.07	2.07	$Ba(NO_3)_2$
14.59	2.49	»	45.74	1.86	»+$NaNO_3$

BARIUM PALMITATE $[CH_3(CH_2)_{14}COO]_2Ba$.

100 cc. abs. alcohol dissolve 0.0041 gm. barium palmitate at t° (?).
(Straüli, 1918, 1926.)

BARIUM Methyl, Glycero, etc. PHOSPHATES.

SOLUBILITY OF EACH IN WATER. (Bailly, 1916, 1919; Bailly and Gaumé, 1924.)

Compound.	Formula.	t°.	Gms. per 100 gms. sat. sol. Anhydrous cmpd.	Hydrated cmpd.
Neutral barium methyl phosphate	$BaCH_3.PO_4.H_2O$	10	2.54	2.72
» » » »	»	15	–	2.02 (Cavalier)
» » » »	»	50	1.05	1.12
» » » »	»	100	0.39	0.42
Acid » » »	$Ba[CH_3.HPO_4]_2.H_2O$	17	23.50	24.68
Barium ethyl phosphate.....	$BaC_2H_5.PO_4.6H_2O$	20	–	6.72 (Pelouze)
» propyl »	$BaC_3H_7.PO_4.2H_2O$	20	–	8.08 (Cavalier)
» isopropyl »	$BaCH(CH_3)_2.PO_4.2H_2O$	16	–	3.52
» isobutyl »	$BaCH_2CH(CH_3)_2PO_4.2H_2O$	24	–	5.65
» allyl »	$BaCH_2.CH=CH_2PO_4$	15	12.0	–
Barium α glycerophosphate.....	$BaC_3H_5(OH)_2PO_4.{}^1/_4H_2O$	16	1.87	
» β » (cryst.).....	» $^1/_2H_2O$	18	3.58	
» » » »	» »	21	4.31	–
» » » »	» $1H_2O$	21	5.25	–
» » » (amorph.)...	»	soluble in all proportions		
Neutral barium glycero phosphate	$BaPO_4.C_2H_4OH\ H_2O$	16	7.27	–
» » » »	»	55	3.50	–
Acid » » »	$Ba[PO_4.HC_2H_4OH]_2.3H_2O$		deliquescent	

NOTE. — In the above experiments constant agitation was not employed and the variations in results for the several forms and for different preparations of the same form, are probably due to incomplete equilibrium.

The following determinations are by Fischer and Pfähler, 1920.

Barium α glycerophosphate.....	$BaC_3H_5(OH)_2PO_4$	22	1.28	–
» acetone »	$BaC_6H_{11}O_6P.3H_2O$	25	3.51	–

BARIUM PICRATE $[C_6H_2(NO_2)_3O]_2Ba.5H_2O$.

SOLUBILITY IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL AT 25°.
(Fischer. 1914, 1918.)

Volume per cent C_2H_5OH.	Gms. $[C_6H_2(NO_2)_3O]_2Ba$ per 100 cc. sat. sol.	Solid Phase.	Volume per cent C_2H_5OH.	Gms. $[C_6H_2(NO_2)_3O]_2Ba$ per 100 cc. sat. sol.	Solid Phase.
0.0.....	1.260	$[C_6H_2(NO_2)_3O]_2Ba.5H_2O$	50.0.....	3.184	$.5H_2O+.4H_2O$
10.0.....	1.037	»	55.0.....	3.335	»
15.0.....	0.889	»	60.0.....	3.483	$[C_6H_2(NO_2)_3O]_2Ba.4H_2O$
20.0.....	0.963	»	65.0.....	3.483	»
25.0.....	1.260	»	70.0.....	3.335	»
30.0.....	1.482	»	75.0.....	3.261	»
35.0.....	1.704	»	80.0.....	3.187	»
40.0.....	2.149	»	85.0.....	3.187	»
45.0.....	1.260 1.842 2.340	» » $+[C_6H_2(NO_2)_3O]_2Ba.4H_2O$	90.0.....	3.113	»
			95.0.....	2.964	»
			100.0.....	5.336	»

At 45.0 per cent alcohol variable results are obtained for the compound containing 5 H_2O. Between 40 and 60 per cent alcohol there is a gradual dehydration of the compound and the curve shows a break. The exact position of the intersection of the two curves could not be determined.

BARIUM PROPIONATE $Ba(C_3H_5O_2)_2.H_2O$.

Solubility of Barium Propionate in Water.
(Wing and Thompson, 1926.

t°.	Gms. $Ba(C_3H_5O_2)_2$ per 100 gms. Sat. sol.	Gms. $Ba(C_3H_5O_2)_2$ per 100 gms. Water.	Solid Phase.	t°.	Gms. $Ba(C_3H_5O_2)_2$ per 100 gms. Sat. sol.	Gms. $Ba(C_3H_5O_2)_2$ per 100 gms. Water.	Solid Phase.
0.3....	36.5	57.5	$Ba(C_3H_5O_2)_2.H_2O$	65.3....	38.9	63.7	$Ba(C_3H_5O_2)_2.H_2O$
5.1....	36.2	56.7	»	75.6....	39.8	66.1	»
15.0....	36.0	56.3	»	80.4....	40.2	67.8	»
24.8....	36.2	56.7	»	85.6....	41.2	70.1	»
34.8....	36.6	57.7	»	90.5....	42.2	73.0	»
44.8....	37.1	59.0	»	95.4....	43.2	76.1	»
55.0....	38.0	61.3	»	100.7....	44.7	82.7	»

The mixtures were constantly stirred for 8 hrs. at the lower temperatures, and for 2-3 hrs. at the higher temperatures. Since barium propionate is hydrolyzed by water in warm solutions the barium was determined as $BaSO_4$ and the amount of propionate calculated.

BARIUM Sulfon PROPIONATE (neutral) $BaC_3H_4O_5S.4H_2O$, *r* and *d*.

100 gms. sat. solution in water contains 6.63 gms. of the anhydrous *r* salt at 24°.6.
100 » » » » 2.00 » » » *d* salt at 24°.6.
(Franchimont and Backer, 1920.)

BARIUM Dinitro SALICYLATE $Ba[C_6H_2(NO_2)_2OHCOO]_2$.

Solubility in Aqueous Solutions of Ethyl Alcohol at 25°. (Fischer, 1914, 1918.)

Vol. per cent C_2H_5OH.	Gms. $Ba[C_6H_2(NO_2)_2.OHCOO]_2$ per 100 cc. sat. sol.	Vol. per cent C_2H_5OH.	Gms. $Ba[C_6H_2(NO_2)_2.OHCOO]_2$ per 100 cc. sat. sol.	Vol. per cent C_2H_5OH.	Gms. $Ba[C_6H_2(NO_2)_2.OHCOO]_2$ per 100 cc. sat. sol.
0.0	0.630	40.0	0.794	80.0	0.894
10.0	0.524	50.0	1.124	90.0	0.320
20.0	0.438	60.0	0.945	100.0	0.382
30.0	0.570	70.0	0.915		

The results are not of the highest accuracy since the saturated solutions were not perfectly clear and the determinations were made by evaporating and drying the dissolved compound.

BARIUM SELENATE $BaSeO_4$.

One liter of H_2O saturated with $BaSeO_4$ by constant agitation at 25° for 96 hours contained 0.0792 gm. when saturation was approached from below and 0.082 gm. when approached from above. (Meyer and Fredrich, 1922 *a*.)

BARIUM SUCCINATE $Ba(CH_2)_2(COO)_2$.

Solubility of Barium Succinate at 25° in Aqueous Solutions of :
(Walker, 1925.)

Calcium Succinate. Gm. mols. per 1000 gms. H_2O.		Magnesium Succinate. Gm. mols. per 1000 gms. H_2O.		Sodium Succinate. Gm. mols. per 1000 gms. H_2O.	
Ba succinate.	Ca succinate.	Ba succinate.	Mg succinate.	Ba succinate.	Na succinate.
0.01383	0.00798	0.01397	0.00770	0.01570	0.0000
0.01275	0.01597	0.01294	0.01538	0.01307	0.00798
0.01155	0.03193	0.01155	0.03074	0.01154	0.01575
		0.01065	0.04620	0.00987	0.03149
		0.01024	0.06149	0.00913	0.04726

The author states that the concentrations are in terms of gram molecules of the saturating salt per 1000 gms. H_2O « Corresponding to the weight-molar concentration of the added salt ».

BARIUM SULFATE $BaSO_4$.

Solubility in Water and in Aqueous Solutions of Salts and Acids. (Karaoglanow, 1917.)

A weighed amount of $BaSO_4$ was boiled in 200 cc. of water or salt solution for 2 hours under a reflux condenser, and allowed to stand 24 hours with frequent shaking. The undissolved residue of $BaSO_4$ was filtered, washed, ignited and weighed. The amount dissolved in the wash water was determined by a special experiment and a correction made for it. By this method the solubility of $BaSO_4$ in water was found to be 0.0043 gms. per liter at room temperature.

Similar determinations were made for aqueous solutions of $BaCl_2$, H_2SO_4, KCl, KNO_3, K_2SO_4, $CaCl_2$, $SrCl_2$, $Pb(NO_3)_2$, $Fe_2(SO_4)_3$, $FeCl_3$, HCl, HNO_3 and various mixtures of these salts and acids. The results obtained for aq. HNO_3 and aq. HCl are as follows:

In Aqueous HNO_3.		In Aqueous HCl.	
Normality of HNO_3.	Gms. $BaSO_4$ per 1000 cc. sat. sol.	Normality of HCl	Gms. $BaSO_4$ per 1000 cc. sat. sol.
0.05	0.014	0.00	0.0043
0.10	0.026	0.10	0.010
0.30	0.076	0.30	0.029
0.50	0.124	0.50	0.0047
1.00	0.237	1.00	0.087
2.00	0.393	2.00	0.146

Solubility of Barium Sulfate in Aqueous Solutions of Hydrochloric and of Nitric Acid. (Kolthoff and Vogelenzang, 1919.)

One-half gram of a specially prepared sample of $BaSO_4$ (preparation D) was shaken for 7-8 hours at constant temperature with 250 cc. of the acid solution. After subsidence a sample of the clear filtrate was evaporated in a platinum dish and the residue ignited and weighed.

Results for Aq. HCl at: 12°.		90°.		Results for Aq. HNO_3 at 19°.	
Normality of HCl.	Gms. $BaSO_4$ per 1000 cc. sat. sol.	Normality of HCl.	Gms. $BaSO_4$ per 1000 cc. sat. sol.	Normality of HNO_3.	Gms. $BaSO_4$ per 1000 cc. sat. sol.
0.098	0.011	0.00(=H_2O)	0.0070	0.05	0.000 (9)
0.49	0.031	0.05	0.0077	0.10	0.0012
0.98	0.0538	0.50	0.0265	0.5	0.0039
		1.00	0.0416	1.0	0.0077
				2.0	0.0119

The authors also agitated samples of $BaSO_4$, prepared in different ways, with conductivity water at 18° and after subsidence determined the conductivity of the saturated solution. After decantation the preparations were again shaken with fresh portions of H_2O and this repeated untill the conductivity became constant. The following results were obtained:

Preparation No.	$K_{18} \times 10^{-6}$.	Milligrams $BaSO_4$ per liter.
A	2.25	2.11
B	2.50	2.35
C	2.20	2.07
D	2.40	2.25
E	2.69	2.53

In a discussion of the variation in solubility of $BaSO_4$ with the size of the grain Balarew, 1925, points out that samples of $BaSO_4$ precipitated from aqueous solutions

with $BaCl_2$ always contain occluded $BaCl_2$ which can be present to the extent of one per cent. Due to this source of error he questions the accuracy of Hulett's observations. Samples of $BaSO_4$ which no longer give a test for chlorides in the wash water, may yield $BaCl_2$ on prolonged grinding.

100 cc. of 97.86 per cent H_2SO_4 constantly agitated with $BaSO_4$ in a thermostat at 25° for 96 hours contain 14.91 gms. $BaSO_4$. (Meyer and Friedrich, 1922.)

Freezing-point lowering data for mixtures of $BaSO_4$ and H_2SO_4 are given by Kendall and Davidson, 1921.

BARIUM Phenyl SULFATE $(C_6H_5O_4S)_2Ba$.

100 gms. sat. solution in alcohol contain 15.0 gms. $(C_6H_5O_4S)_2Ba$ at (hot or cold). (Burkhardt and Lapworth, 1926.)

BARIUM SULFIDE BaS.

Solubility of Commercial Barium Sulfide in Water. (Terres and Brückner, 1920.)

The sample of barium sulfide contained 87.2 % Ba S, 4.33 % $Ba(OH)_2$ and 8.47 % Fe and Mn oxides. Due to the oxidizing action of air upon the sulfhydrate the solubility determinations were conducted in an atmosphere of hydrogen. The mixtures were constantly agitated for many hours.

	Gms. per 100 gms. sat. sol.			Solid Phase changed in Composition between.	
t°.	$Ba(OH)_2$.	$Ba(SH)_2$.	Corresponding BaS in solution.		
0...	2.05	2.42	4.03	44.24 % BaS	14.2 % BaO
20...	3.28	3.90	6.48	–	–
40...	5.32	6.32	10.5	–	–
60...	8.14	9.68	16.5	–	–
80...	10.62	12.61	21.0	–	–
100...	12.80	15.25	25 25	39.0 % BaS	19.5 % BaO

BARIUM SULFONATES.

Solubility of Each in Water.

Compound.	Formula.	t°.	Gms. Anhydrous Cmpd. per 100 cc. sat. sol.	
Barium benzene sulfonate.....	$Ba(C_6H_5SO_3)_2.H_2O$	20	14.35	(1)
» anthracene-1-sulfonate.....	$Ba(C_{14}H_9SO_3)_2.3H_2O$	20	0.069	(1)
» » -2- »	$Ba(C_{14}H_9SO_3)_2.H_2O$	20	0.0048	(1)
» naphtalene-2- »	$Ba(C_{10}H_7SO_3)_2.H_2O$	16.5	0.384	(1)
» » -6-oxy-2-sulfonate.....	$Ba(C_{10}H_7SO_3)_2.6H_2O$	20	1.742	(1)
» » -5-chlor-1-sulfonate....	$Ba(C_{10}H_6SO_3Cl)_2.2H_2O$	20	0.275	(1)
» -5-nitro anthraquinone-1- »	$Ba(C_{14}H_6O_7SN)_2$	20	0.0715	(2)
» -8- » -1- »	$Ba(C_{14}H_6O_7SN)_2$	20	0.2478	(2)
» -10-chlor phenanthrene-3 or 6-sulfonate..	$Ba(C_{14}H_8ClSO_3)_2.2^1/_2H_2O$	20	0.010	(3)
» -2-Naphthylamine-6-8-disulfonate.	$BaC_{10}H_5.NH_2.(SO_3)_2$	15	12.0	(4)
» -2- » -5-7- » .	$BaC_{10}H_5.NH_2.(SO_3)_2$	15	22.7	(4)

(1) Ephraim and Pfister, 1925, 1925*a*; (2) Ullmann and Kertesz, 1919; (3) Sandquist, 1917; (4) Braunschweig, 1922, 1926.

BARIUM TARTRATE, active $C_4H_4O_6.Ba^1/_2H_2O$, racemic $C_8H_8O_{12}.Ba_2$.

Solubility of Each in Water. (Duboux and Cuttat, 1921.)

t°.	Gms. $C_4H_4O_6Ba$ per 100 gms. sat. sol.	Solid phase.
0.....	0.0200	$C_4H_4O_6Ba.^1/_2H_2O$
12.5....	0.0247	»
25.0....	0.0294	»
37.5....	0.0341	»

t°.	Gms. $C_8H_8O_{12}Ba_2$ per 100 gms. sat. sol.	Solid Phase.
0.....	0.0243	$C_8H_8O_{12}Ba_2$
12.5....	0.0284	»
25.0....	0.0325	»
37.5....	0.0366	»

BARIUM DITHIONATE $BaS_2O_6.2H_2O$.

Solubility in Water. (de Baat, 1926.)

t°.	Gms. BaS_2O_6 per 100 gms. sat. sol.	Solid Phase.
0	7.86	$BaS_2O_6.2H_2O$
12	12.45	»
20	15.75	»
30	19.86	»

Solubility of Barium Dithionate in Aqueous Solutions of Magnesium Dithionate and Vice Versa at 20° and at 30°. (de Baat, 1926.)

Results at 20°. Gms. per 100 gms. sat. sol.			Results at 30°. Gms. per 100 gms. sat. sol.		
BaS_2O_6.	MgS_2O_6.	Solid Phase.	BaS_2O_6.	MgS_2O_6.	Solid Phase.
15.75	0.0	$BaS_2O_6.2H_2O$	13.37	7.05	$BaS_2O_6.2H_2O$
10.61	6.93	»	5.85	18.91	»
1.29	31.14	»	1.92	29.16	»
0.69	33.95	»+$MgS_2O_6.6H_2O$	0.90	34.57	»+$MgS_2O_6.6H_2O$
0.0	33.91	$MgS_2O_6.6H_2O$	0.0	35.24	$MgS_2O_6.6H_2O$

Solubility of Barium Dithionate in Aqueous Solutions of Potassium Dithionate and Vice Versa at Several Temperatures. (de Baat, 1926.)

Results at 0°. Gms. per 100 gms. sat. sol.		Results at 20°. Gms. per 100 gms. sat. sol.		Results at 30°. Gms. per 100 gms. sat. sol.		
BaS_2O_6.	$K_2S_2O_6$.	BaS_2O_6.	$K_2S_2O_6$.	BaS_2O_6.	$K_2S_2O_6$.	Solid Phase at Each Temp.
8.02	1.21	16.43	2.69	20.64	4.16	$BaS_2O_6.2H_2O$
8.88	2.75	17.15	6.03	20.69	8.03	»+$K_2S_2O_6$
4.69	2.60	11.82	6.02	20.50	8.11	$K_2S_2O_6$
0.0	2.52	0.0	6.23	11.74	8.33	»
				6.02	8.49	»
				0.0	8.54	»

Solubility of Barium Dithionate in Aqueous Solutions of Sodium Dithionate and Vice Versa at Several Temperatures. (de Baat, 1923, 1926.)

Results at 0°. Gms. per 100 gms. sat. sol.		Results at 12°. Gms. per 100 gms. sat. sol.		Results at 20°. Gms. per 100 gms. sat. sol.		Results at 30°. Gms. per 100 gms. sat. sol.		
BaS_2O_6.	$Na_2S_2O_6$.	BaS_2O_6.	$Na_2S_2O_6$.	BaS_2O_6.	$Na_2S_2O_6$.	BaS_2O_6.	$Na_2S_2O_6$.	Solid Phase at Each Temp.
7.45	2.74	11.05	6.95	13.81	6.63	17.06	6.36	$BaS_2O_6.2H_2O$
5.86	6.23	10.76	9.27	12.66	11.02	14.45	13.09	»+$Na_2S_2O_6.2H_2O$
2.51	6.94	7.57	9.82	7.45	12.12	13.23	13.31	$Na_2S_2O_6.2H_2O$
0.0	6.05	0.0	10.63	0.0	13.39	7.32	14.87	»
						0.0	17.23	»

Solubility of Barium Dithionate in Aqueous Solutions of Ethyl Alcohol at 30°. (de Baat, 1926.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
BaS_2O_6.	C_2H_5OH.	Solid Phase.	BaS_2O_6.	C_2H_5OH.	Solid Phase.
19.86	0.0	$BaS_2O_6.2H_2O$	0.37	42.53	$BaS_2O_6.2H_2O$
12.74	4.67	»	0.03	61.24	»
4.24	16.86	»	0.01	76.61	»
2.74	21.36	»	0.009	87.00	»
0.86	31.91	»	0.000	98.81	»

BARIUM THIOSULFATE BaS_2O_3.

SOLUBILITY IN WATER AND IN AQUEOUS SOLUTIONS AT 18°.5.
(Leo. 1922.)

Solvent.	Gms. BaS_2O_3 per 100 gms. sat. sol.
Water	0.2100
250 cc. H_2O + 3.2 gms. $Na_2S_2O_3.5H_2O$	0.1375
200 » » + 20.0 » »	0.1480
100 » » + 100 cc. acetone	0.0318

BEHENIC ACID $C_{21}H_{43}COOH$.

SOLUBILITY IN AQUEOUS SOLUTIONS OF ETHYL ALCOHOL AT 0° AND 25°.
(Thomas and Mattikow, 1926.)

Wt. per cent C_2H_5OH in solvent.	Gms. $C_{21}H_{43}COOH$ per 100 cc. sat. sol. at 0°.	Gms. $C_{21}H_{43}COOH$ per 100 cc. sat. sol. at 25°.
63.07	0.002	0.010
86.16	0.010	0.111
91.53	0.013	0.206

BENZALDEHYDE C_6H_5CHO.

MUTUAL SOLUBILITY OF BENZALDEHYDE AND GLYCEROL.
(Mc Ewen, 1923.)

t° of solution.	Gms. C_6H_5CHO per 100 gms. sat. sol.	t° of solution.	Gms. C_6H_5CHO per 100 gms. sat. sol.	t° of solution.	Gms. C_6H_5CHO per 100 gms. sat. sol.
67.5	4.53	144.5	26.63	152.5	77.13
103.5	7.74	160.3*	49.22	127.5	90.10
123.5	12.42	160.7*	55.29	107.5	94.50
140.0	23.87	159.5	62.30	85.5	97.02

* = Critical opalescence.

Hydroxy**BENZALDEHYDES** *o*, *m* and *p* $C_6H_4OH.CHO$.

SOLUBILITY OF EACH IN WATER.
(Sidgwick and Allott, 1923.)

The determinations were made by the synthetic, sealed tube, method. The concentrations are in terms of Wt. %, that is, the grams of *o*, *m* or *p* $C_6H_4OH.CHO$ per 100 gms. sat. sol.

The points at which a second liquid phase separates are marked L. The unstable points are marked *.

Results for Ortho Hydroxybenzaldehyde.		Results for Meta Hydroxybenzaldehyde.		Results for Para Hydroxybenzaldehyde.			
t°.	Wt. %.	t°.	Wt. %.	t°.	Wt. %.	t°.	Wt. %.
85.8	1.68 L	43.0	2.73	30.5	1.33	62.8 tr. pt.	27.4
136.5	3.59 L	57.8	9.38	52.0	4.34	63.8	42.2 L
154.0	5.34 L	58.9	11.0	59.2	8.32	62.8 tr. pt.	46.2
.....	....	63.5	19.2 L	61.9	13.2	63.0	49.8
.....	....	66.0	29.2 L	52.8	13.2*L	61.8	49.8*L
.....	....	66.1	31.9 L	62.8	20.7	64.1	60.0
.....	....	66.2	40.1 L	60.5	20.7*L	69.3	76.6
146.3	90.56 L	65.6	43.4	62.8	26.6	83.6	88.8
118.3	93.20 L	62.4	53.9	62.4	26.6*	116.0	100.0
67.4	97.13 L	60.4	65.1				
		71.2	83.3				
		81.1	84.0				
		106.0	100.0				

Solubility of Ortho, Meta and Para Hydroxybenzaldehydes in Benzene.
(Sidgwick and Allott, 1923.)

The determinations were made by the synthetic, sealed tube method. Wt. % signifies the gms. of *o*, *m* or *p* $C_6H_4OH\,CHO$ per 100 gms. sat. sol. In case of the results marked B benzene separates as the solid phase.

Ortho.		Meta.		Para.	
t°.	Wt. %.	t°.	Wt. %.	t°.	Wt. %.
5.32..	0.0 B	61.3....	6.29	65.0....	3.64
3.65..	4.35 B	67.1....	10.42	81.4....	11.09
2.15..	8.23 B	71.2....	16.6	84.1....	20.0
1.00..	10.90 B	75.7....	27.1	86.7....	31.0
—0.60..	15.0 B	79.1....	40.0	89.5....	46.0
—3.35..	20.4 B	82.4....	52.5	93.5....	59.8
—5.40..	25.0 B	83.6....	59.5	100.6....	72.6
—8.20..	31.4 B	89.8....	77.2	116.0....	100.0
12.15..	39.2 B	106.0....	100.0		

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are give by Kremann and Pogantsch for mixtures of *m* oxybenzaldehyde and each of the following compounds : benzoic acid, *o*, *m* and *p* dinitrobenzene, hydroquinone, picric acid, phenol, *o* and *p* nitrophenol, 1.2.4 dinitrophenol, α and β naphthol, pyrogallol, pyrocatechol, resorcinol, salicylic acid, 1.2.4 dinitrotoluene, trinitrotoluene (m. pt. 81). Similar data are given by Rheinboldt, Henning and Kircheisen, 1925, for mixtures of *m* oxybenzaldehyde and picric acid.

Nitro**BENZALDEHYDES** *o*, *m* and *p* $C_6H_4NO_2.CHO$.

Solubility of Ortho, Meta and Para Nitrobenzaldehydes in Water.
(Sidgwick and Dash, 1922.)

The sealed tube method was used at the higher temperatures and the Beckmann apparatus at the lower. The temperatures of the triple points (tr. pt.) corresponding to solid aldehyde in contact with two liquid layers, were determined in separate experiments and the composition estimated by extrapolation on the plotted curves. S indicates solid nitrobenzaldehyde. The complete solubility curves were realized for the meta and para compounds but that for the ortho compound could not be taken above 100° on account of decomposition.

Results for Ortho Nitro benzaldehyde.

t°.	Wt. % $o\,C_6H_4NO_2.CHO$.
66.9.....	0.70
103.1.....	1.53
166.0.....	4.75
—	—
161.7.....	93.56
145.1.....	94.80
113.5.....	96.49
63.8.	99.00
43.5.....	100.00
39.7(tr. pt.)..	99.9

Results for Meta Nitro benzaldehyde.

t°.	Wt. % $m\,C_6H_4NO_2.CHO$.	t°.	Wt. % $m\,C_6H_4NO_2.CHO$.
40.5.....	0.39 S	212.....	(crit. sol. temp.)
75.1.....	0.96	211.7.....	56.23
111.9.....	1.95	195.3.....	78.77
136.4.....	3.01	179.3.....	86.75
147.1.....	3.95	167.0.....	90.18
157.3.....	4.92	152.0.....	92.87
181.0.....	10.51	126.2.....	95.67
191.4.....	14.03	85.2.	97.83
205.4.....	23.35	58.0.....	100.00
211.8.....	39.62	51.0 (tr. pt.).	99.6

Results for Para Nitro benzaldehyde.

t°.	Wt. % $p\,C_6H_4NO_2.CHO$.	t°.	Wt. % $p\,C_6H_4NO_2.CHO$.	t°.	Wt. % $p\,C_6H_4NO_2.CHO$.
90.2.....	0.97 S	216....	(crit. sol. temp.)	164.6.....	92.74
132.4.....	2.91	215.7..	51.92	134.2.....	96.70
176.5.....	8.78	213.4..	63.19	106.5.....	100.00
205.4.....	20.67	172.6..	90.65	97.1 (tr. pt.).	98.2
215.5.....	37.77				

100 gms. abs. Alcohol dissolve 22.14 gms. Nitro benzaldehyde at 20–25°. (Pucher and Dehn, 1921.)
» » Quinoline » 1.96 » » » » »
100 gms. equi-mol. mixture of Alcohol and Quinoline dissolve 7.07 gms. Nitro benzaldehyde at 20–25°.

Solubility of Ortho, Meta and Para Nitrobenzaldehydes in Benzene

(Sidgwick anc Dash, 1922.)

See remarks, preceding page. B = solid benzene.

Ortho Nitrobenzaldehyde Wt. %.		Meta Nitrobenzaldehyde Wt. %.		Para Nitrobenzaldehyde Wt. %.	
t°.	*o* $C_6H_4NO_2.CHO$.	t°.	*m* $C_6H_4NO_2.CHO$.	t°.	*p* $C_6H_4NO_2.CHO$.
5.1.....	1.17 B	5.0.....	1.20 B	5.3.....	0.00 B
4.7.....	2.47 B	4.7.....	2.40 B	5.0.....	1.00 B
4.4.....	3.51 B	4.3.....	4.28 B	4.6.....	2.00 B
3.9.....	4.98 B	4.0.....	4.98 B	4.4.....	2.75 B
2.7.....	10.12 B	2.4.....	10.14 B	4.1.....	3.57 B
1.2.....	15.18 B	1.0.....	15.15 B	4.1 (Eutec.)	3.6
— 0.4.....	20.09 B	— 0.8 (Eutec.)	15.75	7.5.....	4.06
— 1.5.....	25.23 B	+ 0.9.....	16.16	12.6.....	5.01
— 1.7 (Eutec.)	26.50	2.8.....	17.55	23.4.....	7.57
— 1.2.....	26.85	4.9.....	19.03	30.8.....	10.15
+ 1.2.....	29.59	9.8.....	23.55	40.5.....	15.00
4.9.....	35.35	14.7.....	28.43	48.3.....	20.53
8.2.....	40.24	18.5.....	33.77	57.5.....	29.61
11.3.....	45.48	21.7.....	38.91	62.2.....	35.31
13.0.....	48.84	25.6.....	47.68	65.7.....	40.42
15.8.....	54.40	29.4.....	54.53	71.3.....	49.82
19.4.....	60.74	33.0.....	62.30	77.2.....	61.12
24.6.....	70.98	36.3.....	68.87	81.0.....	67.56
27.2.....	76.28	39.2.....	74.35	84.9.....	73.54
30.2.....	81.60	41.2.....	78.36	87.8.....	78.85
34.1.....	87.82	43.9.....	83.23	93.0.....	85.54
39.1.....	95.08	47.7.....	88.80	98.6.....	92.83
43.5.....	100.00	51.7.....	94.49		
		58.0.....	100.00		

Freezing-point lowering data for binary mixtures of *o*, *m* and *p* Nitrobenzaldehyde are given by Brady and Harris, 1923.

Polymorphic NitroBENZALDEHYDRAZONES

Solubility of the Stable and Labile Forms of Polymorphic Nitrobenzaldehydrazones in Alcohol.

(Chattaway and Walker, 1924.)

Equilibrium attained by constant shaking for 4 to 6 hours in the case of the stable forms and 1 to 2 hours in the case of the labile forms. The solutions were analyzed by evaporating and weighing the residues.

Results for :
o Nitrobenzaldehyde-2-chloro-4-bromo-phenyl hydrazone.

t°.	Gms. cmpd per 100 gms. sat. sol. Stable form.	Labile form.
0.05.....	0.039	0.073
5.25.....	0.047	0.082
10.5.....	0.056	0.093
15.0.....	0.065	0.106
18.0.....	–	0.118
20.0.....	0.079	–
25.0.....	0.093	0.150
30.0.....	0.116	0.179
37.85.....	0.159	–

Results for :
p Nitrobenzaldehyde-2:4-dichloro-phenyl hydrazone.

t°.	Gms. cmpd per 100 gms. sat. sol. Stable form.	Labile form.
0.05.....	0.052	0.079
5.85.....	0.057	0.086
11.90.....	0.064	0.097
16.0.....	0.075	0.105
21.5.....	0.087	0.126
29.85.....	0.115	0.173
34.80.....	0.142	0.225
39.34.....	0.173	–
44.15.....	0.214	–

p Nitrobenzaldehyde-4-chloro-2-bromo phenyl hydrazone (Stable form).

t°.	Gms. per 100 gms. sat. sol.	t°.	Gms. per 100 gms. sat. sol.	t°.	Gms. per 100 gms. sat. sol.
0.05.....	0.034	20.0.....	0.066	33.5.....	0.109
12.5.....	0.052	26.9.....	0.087	40.05.....	0.141

BENZAMIDE $C_6H_5CONH_2$.

SOLUBILITY OF BENZAMIDE IN ETHYL ALCOHOL. (Speyers, 1902; See Note page 1001.)

t°.	d. of sat. sol.	Gm. mol. $C_6H_5CONH_2$ per 100 G. M. sat. sol.	Gms. $C_6H_5CONH_2$ per 100 gms. C_2H_5OH.	t°.	d. of sat. sol.	Gm. mol. $C_6H_5CONH_2$ per 100 G. M. sat. sol.	Gms. $C_6H_5CONH_2$ per 100 gms. C_2H_5OH.
0.0..	0.833	3.1	8.35	40...	0.848	11.5	33.0
10.0..	0.832	4.2	11.5	50...	0.862	14.2	43.5
20.0..	0.833	6.2	16.0	60...	0.881	17.2	54.5
25.0..	0.835	7.4	19.0	70...	0.913	20.0	66.5
30.0..	0.838	8.8	23.0				

SOLUBILITY OF BENZAMIDE IN SEVERAL SOLVENTS.

Solvent.	t°.	Gms $C_6H_5CONH_2$ per 100 gms. solvent.	Authority.
Water	12	0.58	(Oliveri-Mandala, 1926.)
10.2 % aq. sol. of Antipyrine	12	0.60	»
Absolute alcohol	20–25	17.03	(Pucher and Dehn, 1921).
Quinoline	»	6.27+	»
Equi. mol. mixture of C_2H_5OH+Quinoline.	»	18.55+	»

SOLUBILITY OF BENZAMIDE IN MIXTURES OF ETHYL ALCOHOL AND WATER. (Pleuger, 1925.)

Wt. per cent C_2H_5OH in solvent.	Gms. $C_6H_5CONH_2$ per 100 gms. sat. solution at : 30°.	50°.	70°.	90°.	110°.
0.0 (= H_2O)	–	2.0	7.5	81.0	95.0
10.0	2.0	5.5	36.0	82.5	94.5
30.0	8.5	23.5	57.5	82.0	93.8
49.5	17.0	37.0	62.0	81.0	93.0
65.8	22.0	40.0	61.0	78.7	92.0
84.6	22.0	37.0	56.0	75.0	91.0
100.0	16.0	29.0	48.0	69.7	88.0

SOLUBILITY OF BENZAMIDE IN MIXTURES OF ETHYL ALCOHOL AND CARBON DISULFIDE. (Pleuger, 1925.)

Wt. per cent C_2H_5OH in solvent.	Gms. $C_6H_5CONH_2$ per 100 gms. sat. solution at : 30°.	50°.	70°.	90°.	110°.	120°.
0.0 (= CS_2)	–	–	–	–	75.0	90.0
19.9	6.5	14.0	28.0	55.0	81.5	92.0
38.0	12.0	22.5	40.0	63.0	84.5	93.5
60.7	14.5	27.5	46.5	67.7	86.7	»
79.2	15.5	28.5	47.5	69.0	87.5	»
100.0	16.0	29.0	48.0	69.7	88.0	95.5

SOLUBILITY OF BENZAMIDE IN MIXTURES OF ETHYL ALCOHOL AND CARBON TETRACHLORIDE. (Pleuger, 1925.)

Wt. per cent C_2H_5OH in solvent.	Gms. $C_6H_5CONH_2$ per 100 gms. sat. solution at : 30°.	50°.	70°.	90°.	110°.	120°.
0.0 (= CCl_4)	–	–	–	–	45.0	85.5
19.8	5.0	10.0	20.5	43.5	75.5	90.0
40.2	9.0	18.0	33.5	56.0	81.0	92.5
60.7	12.0	23.0	40.0	63.0	84.5	93.5
80.0	14.5	26.5	45.0	67.5	86.5	94.5

Freezing-point lowering data are given for mixtures of benzamide and the following compounds : benzoic acid, benzoic anhydride (Kremann, Mauermann and Oswald, 1923); *o*, *m* and *p* dioxybenzene, *o*, *m* and *p* oxybenzoic acid, *o*, *m* and *p* nitrophenol, α and β naphthol (Kremann and Auer, 1918); phenol (Kremann and Wenzing, 1917); pyrogallol (Kremann and Zechner, 1918); 1.4, 1.5, 1.6, 1.8, 2.6, 2.7 and 2.3 dioxynaphtalene (Kremann, Hemmelmayr, and Riemer, 1922).

Freezing-point data for mixtures of BENZANILIDE and veronal are given by Pfeiffer and Angern, 1926.

SOLUBILITY IN SEVERAL SOLVENTS OF THE COMPOUND, $NH_2CO.C_6H_4.N = N.CO.NH_2$, FORMED BY THE ACTION OF IODINE UPON META BENZAMIDO-SEMICARBAZIDE (M. PT. 186°). (Doucet, 1923.)

Solvent.	Gms. cmpd. per 100 gms. solvent at 15°.	Gms. cmpd. per 100 gms. solvent at b. pt.
Water	0.07	3.25
95 % Ethyl alcohol	0.70	2.20
Acetone	0.80	-

BENZENE C_6H_6.

100 gms. sat. sol. of Benzène in Water contain 0.153 gms. C_6H_6 at 0°. (Hill, 1922.)

SOLUBILITY OF BENZENE VAPOR IN WATER AT 25°. (Milligan, 1925.)

A mixture of air and benzene vapor of known composition was shaken with water at 25° and the residual mixture analyzed by means of a Haldane gas analysis apparatus. The amount of benzene vapor dissolved was thus found by difference. The coefficient of solubility (volume of gas, reduced to 0°, which dissolves in one volume of water at 25°, when the pressure of the gas over the water is 760 mm.) was found to be $\alpha_{25} = 1.5$.

From this value it was calculated that approximately 0.07 cc. of liquid benzene is dissolved by 100 cc. of H_2O at 25°.

SOLUBILITY OF BENZENE IN SUPER-HEATED WATER. (Jaeger, 1923.)

The determinations were made in a large shaking autoclave. Mixtures of 500 cc. of benzene and 2 liters of water were shaken 10 minutes at each temperature, and then allowed to stand 20 minutes, 500 cc. of the solution was withdrawn and allowed to stand a day. The volume of separated oil was then carefully determined.

t°	100°.	150°.	200°.	250°.	285°.	300°.
cc. C_6H_6 dissolved per 100 cc. H_2O	0.2	0.6	2.1	7.3	10.6	14.6

The following values were obtained for :

Solvent Benzol (b. pt. 140°-190°).				Pure Benzin from Petroleum (b. pt. 65°-100°).			
t°	150°.	200°.	25°.	t°	150°.	200°.	250°.
Gms. solvent benzol per 100 cc. H_2O	0.04	0.17	1.15	Gms. Benzin per 100 cc. H_2O	0.04	0.2	0.9

EQUILIBRIUM IN TERNARY MIXTURES COMPOSED OF BENZENE, ALCOHOLS AND WATER. (Perrakis, 1925.)

The amount of water required to produce clouding in various mixtures of benzene and alcohols was determined by a titration method.

Results for mixtures of benzene and :

Normal Butyl Alcohol at 19°.		Ethyl Alcohol at 21°.		Methyl Alcohol at 20°.		Isopropyl Alcohol at 19°.	
Wt. % alcohol in mixture.	Gms. H_2O to cause clouding in 100 gms. mixture.	Wt. % alcohol in mixture.	Gms. H_2O to cause clouding in 100 gms. mixture.	Wt. % alcohol in mixture.	Gms. H_2O to cause clouding in 100 gms. mixture.	Wt. % alcohol in mixture.	Gms. H_2O to cause clouding in 100 gms. mixture.
15.75	0.8553	15.87	0.9930	22.90	0.9456	13.22	0.8897
21.02	1.4898	20.28	1.8817	32.06	1.6624	19.46	1.6493
26.68	2.2610	23.50	2.7093	37.80	2.2900	24.60	2.3165
30.26	2.8315	26.45	3.4722	40 70	2.9080	28.20	2.9408
32.84	3.4035	28.75	4.2046	45.02	3.3721	30.96	3.5283
34.92	3.9640	30.92	4.9000	48.59	3.8000	32.31	4.1593
36.78	4.4925	33.33	5.5077	51.22	4.1888	33.53	4.7646
38.54	4.9916	35.41	6.0985	54.01	4.5111	34.84	5.3381
42.28	5.8673	37.02	6.6902	55.65	4.9000	36.10	5.8770
56.16	9.3456	38.38	7.2826	57.16	5.2640	37.43	6.4164
		45.57	10.2794	64.23	7.1093	43.61	9.2394

Equilibrium in the System Benzene, Ethyl Alcohol and Water.
(Wehrmann, 1921.)

To given volumes of mixtures of alcohol and water of known percentage composition, as determined by specific gravity, benzene was added from a buret untill clouding occurred.

t°.	Per cent C_2H_5OH in Aq. Alcohol employed.	Composition of the mixture in vol. per cent at the point of Clouding. C_6H_6.	C_2H_5OH.	H_2O.
—10....	40	0.5	42.1	57.4
—10....	60	3.9	59.5	36.6
—10....	70	10.2	63.7	26.1
—10....	80	20.0	63.5	16.5
—10....	90	52.8	42 4	4.8
± 0....	10	0.32	10.38	89.3
± 0....	30	0.37	26.83	72.8
± 0....	40	0.9	40.9	58.2
± 0....	50	2.5	51.2	46.3
± 0....	60	4.55	57.9	37.55
± 0....	70	12.6	61 4	26.0
± 0....	80	24.8	59.5	15.7
± 0....	90	63.5	32.7	3.8
± 0....	96	92.7	7.1	0.2
+10....	40	1.4	40.8	57.8
+10....	60	5.3	56.9	37.8
+10....	70	14.5	60.0	25.5
10....	80	29.4	55.9	14.7
10....	90	68.0	28.7	3.3
20....	10	0.35	10.35	89.3
20....	30	0.95	26.65	72.4
20....	50	3.6	50.4	46.0
20....	60	7.2	55.7	37.1
20....	70	18.1	57.6	24.3
20....	80	33.7	52.2	14.1
20....	90	70.5	26.2	3.3
20....	96	98.5	1.46	0.04
30....	20	0.9	19.5	79.6
30....	40	2.6	40.2	57.2
30....	60	8.6	54.9	36.5
30....	70	18.9	57,0	24.1
30....	80	39.6	47.5	12.9
30....	90	74.0	23.3	2.7

Equilibrium in the System Benzene, Ethyl Alcohol and Water.
(Sidgwick and Spurrell, 1929.)

Benzene was added to known mixtures of alcohol and water untill two layers appeared or benzene crystallized out. For the two liquid equilibrium, the point was taken at which, on slow cooling, sufficient turbidity was produced to obscure a bright object placed behind the liquid. The extensive series of results were plotted on cross section paper and from the curves the following values for definite temperatures were interpolated.

Wt. per cent C_6H_6 which yielded a second liquid layer (or crystallized benzene) when added to a mixture of $C_2H_5OH + H_2O$ containing.

t°.	100 wt.% C_2H_5OH.	99.5 wt.% C_2H_5OH.	98.0 wt.% C_2H_5OH.	95.76 wt.% C_2H_5OH.	90.06 wt.% C_2H_5OH.	86.0 wt.% C_2H_5OH.	80.1 wt.% C_2H_5OH.	74.48 wt.% C_2H_5OH.	69.08 wt.% C_2H_5OH.	57.66 wt.% C_2H_5OH.
25...	–	–	–	–	87.22*	73.25*	59.41*	41 32*	27.46*	12.61*
15...	–	–	–	–	85.05*	70.95*	55.00*	35.10*	23 38*	10.47*
5...	99.48	–	–	–	83.05*	67.65*	46.92*	29.81*	20.08*	8.95*
4...	97.57	–	–	–	82.95*	–	46 18*	29.32*	19.75*	8.81*
3...	93.82	92.65	92.52	91.22	82.76*	–	45.42*	28.85*	19.45*	8.68*
3...	–	–	–	–	–	–	–	–	–	8.61
2...	87.90	85.28	85.06	82.64	71.90	–	39.24	26.00	17.70	8.21
2...	–	–	–	–	82.55*	–	44.50*	28.46*	19.10*	8.55*
1...	80.89	78.36	76.58	72.78	59.80	–	33.15	23.60	16.45	7.86
1...	–	–	–	–	82.35*	–	43.70	27.95	18.78*	8.44*
0...	74.08	71.87	69.25	65.03	52.01	–	29.85	21.74	15.35	7.53
0...	–	–	–	–	82.10*	–	43.08	27.59*	18.48*	8.32*
—1...	67.79	66.45	63.93	59.48	46.39	–	27.34	20.11	14.25	7.22
—2...	62.87	61.70	59.62	55.07	42.00	–	25.40	18.93	13.27	6.92
—3...	59.10	57.54	56.00	51.17	39.00	–	23.52	17.80	12.40	6.65
—4...	55.56	54.49	52.71	47.82	37.48	–	22.21	16.75	11.56	6.38
—5...	52.60	51.85	49.90	44.81	34.45	–	21.00	15 82	10.80	6 12
Triple pt...	–	–	–	96.76 +4.10°	82 62 +2.55°	66.38 +2.52°	44 95 +2.50°	28 75 +2.64°	19.28 +2.86°	8.70 3.20°

* Indicates two liquid layers. The results for 100 % C_2H_5OH are from Pickering.

Equilibrium in the System Benzene, Ethyl Alcohol and Water at 25° and at 60°. (Barbaudy, 1926.)

The clouding points were determined by adding mixtures of $C_2H_5OH + H_2O$ to mixtures of $C_2H_5OH + C_6H_6$ containing in both cases approximately the same C_2H_5OH content.

Results at 25°.

Gms. per 100 gms. of mixture.

C_2H_5OH.	C_6H_6.	H_2O.
0.0	99.9	0.1
5.85	93.65	0.50
10.09	88.96	0.95
20.00	76.97	3.03
30.00	63.20	6.80
40.00	47.70	12.30
49.04	28.23	21.83
49.88	9.03	41.09
46.90	5.91	47.19
40.00	1.50	59.50
30.00	0.50	69.50

Results at 60°.

Gms. per 100 gms. of mixture.

C_2H_5OH.	C_6H_6.	H_2O.
0.0	0.23	99.77
36.58	4.08	59.34
40.81	6.91	52.28
43.84	10.74	45.42
45.22	16.95	37.83
46.13	20.76	33.11
43.84	29.97	26.19
40.00	41.46	18.54
34.78	52.39	12.83
26.96	65.54	7.50
17.87	78.60	3.53
0.00	99.75	0.25

In order to determine the conjugated solutions, mixtures were prepared to yield two layers and each of these were analyzed by determinations of density and index of refraction.

Composition of Conjugated Solutions at 25°.

Upper layer. Gms. per 100 gms.			Lower layer. Gms. per 100 gms.		
C_2H_5OH.	C_6H_6.	H_2O.	C_2H_5OH.	C_6H_6.	H_2O.
1.35	98.54	0.11	17.5	0.0	82.5
3.18	96.54	0.24	30.7	0.55	68.75
5.29	94.37	0.34	36.0	0.90	63.1
34.1	51.05	8.85	40.85	46.25	12.9

Composition of Conjugated Solutions at 60°.

Upper layer. Gms. per 100 gms.			Lower layer. Gms. per 100 gms.		
C_2H_5OH.	C_6H_6.	H_2O.	C_2H_5OH.	C_6H_6.	H_2O.
16.33	80.97	2.7	39.62	5.87	54.51
16.76	79.40	3.34	40.23	6.18	53.57
25.40	67.98	6.62	40.50	17.26	36.24
34.68	51.18	14.13	42.92	31.46	25.62
30.96	46.48	16.56	41.39	35.53	23.08

Equilibrium in the System Benzene, Ethyl Alcohol and Water at 15°, 25° and 30°. (Ormandy and Craven, 1921.)

The benzene is given in per cent by weight in the mixture and the alcohol in weight percent. The results therefore, show, for the points of clouding, the per cent by weight of benzene present in a mixture composed of benzene and aqueous alcohol of the particular weight per cent shown.

Results at 15°.		Results at 25°.		Results at 30°.	
Wt. % aq. Alcohol used.	Gms. C_6H_6 per 100 gms. final mixture.	Wt. % aq. Alcohol used.	Gms. C_6H_6 per 100 gms. final mixture.	Wt. % aq. Alcohol used.	Gms. C_6H_6 per 100 gms. final mixture.
58.5	10	95.11	97.13	93.14	96.06
67.9	20	91.86	90.53	91.20	90.00
72.9	30	87.98	80.60	88.91	84.01
76.7	40	86.52	76.48	85.98	76.46
79.3	50	84.71	71.00	83.25	69.32
82.0	60	82.99	67.02	80.75	63.13
85.1	70	81.34	62.52	77.91	55.03
88.4	80	79.83	58.33	76.57	50.99
92.3	90	78.44	54.24	72.61	38.17
		77.58	51.23	63.29	18.68

The results at 15° were read from the curve plotted from 30 determinations. They agree quite closely with similar determinations reported by Sidgwick and Spurrell, 1920; Taylor, 1897; and Bonner, 1910.

Solubility of Benzene in Dilute Solutions of Ethyl Alcohol.
(Ormandy and Craven, 1922.)

A mechanical stirrer was used. Readings were taken at the point where turbidity was distinctly visible and at the point where the liquid became quite clear. The mean of these was taken as the true equilibrium point. The results, were plotted and the following table constructed from the curves.

Strength of Alcohol in wt. %	Results for Benzene at 0°.	15°.	30°.	Results for Petrol A at 15°.	Results for Petrol + benzene (1:1) at 15°.
0.....	0.08	0.15	–	0.004	–
5.....	0.08	0.15	–	–	–
10.....	0.10	0.16	–	–	–
15.....	0.13	0.19	–	–	–
20.....	0.16	0.24	–	–	–
25.....	0.24	0.38	–	–	–
30.....	0.38	0.62	1.32	0.01	0.06
35.....	0.62	1.02	1.88	0.04	0.12
40.....	1.14	1.80	2.64	0.09	0.24
45.....	1.80	3.00	–	0.20	0.45
50.....	–	–	–	0.42	–

The figures show the percent by weight of benzene and petrol in the final equilibrium mixtures. It is evident from the results that benzene can be effectively removed from alcohol by dilution and extraction with petrol, hence, it is a rather poor denaturant for alcohol.

Data for equilibrium at — 15°, 0°, 15° and 30° in a system composed of 3 volumes of benzene + 1 volume of toluene (instead of benzene alone), alcohol and water, are given by Ormandy and Craven, 1921.

Solubility of Benzene in : (Wright, 1926.)

Aq. 50 wt. % C_2H_5OH.		Aq. 50 wt. % C_2H_5OH containing 5 % NaCl.		Aq. 50 wt. % C_2H_5OH containing K_2CO_3, at 20°.		Aq. 50 wt. % C_2H_5OH sat. with various salts at 20°.	
t°.	Gms. C_6H_6 per 100 gms. sat. sol.	t°.	Gms. C_6H_6 per 100 gms. sat. sol.	Per cent K_2CO_3.	Gms. C_6H_6 per 100 gms. sat. sol.	Salt.	Gms. C_6H_6 per 100 gms. sat. sol.
11.2	4.57	9.1	5.80	1.12	6.4	None	5.8
13.2	4.78	11.8	6.10	1.67	6.5	NaCl (10.6)	9.6
15.5	5.05	14.2	6.39	2.18	7.1	NaNO (21.2)	9.5
18.0	5.30	16.7	6.76	2.48	7.3	KCl (6.5)	6.7
20.2	5.61	19.2	7.23	2.68	7.6*	KNO_3 (3.9)	6.4
22.6	5.97	21.3	7.57	2.86	8.0	KBr (17.4)	7.8

*Two liquid layers form. The figures in parentheses show the grams of each salt per 100 gms. of sat. solution.

Freezing-Points of Mixtures of Benzene and Aqueous Ethyl Alcohol.
(Ormandy and Craven, 1921.)

Results for benzene and :

99.3 wt. % C_2H_5OH.		90.3 wt. % C_2H_5OH.		80.3 wt. % C_2H_5OH.		70.3 wt. % C_2H_5OH.	
F. pt.	Gms. C_6H_6 per 100 gms. sat. sol.	F. pt.	Gms. C_6H_6 per 100 gms. sat. sol.	F. pt.	Gms. C_6H_6 per 100 gms. sat. sol.	F. pt.	Gms. C_6H_6 per 100 gms. sat. sol.
—11.4	38.4	—10.2	26.9	—11.8	15.1	— 9.6	9.1
—13.3	35.7	—12.1	24.5	—16.9	11.9	—14.9	7.4
—15.3	33.3	—14.3	22.4	—19.9	10.6		
—17.3	31.1	—17.1	20.1	—22.4	9.6		
—19.3	29.0	—19.9	17.9	—25.4	8.6		
—21.4	27.1	—22.8	16.4	—29.0	7.6		
—24.1	25.0	—26.0	14.9	—30.6	7.3		
—26.0	23.6	—29.0	13.7				
—30.5	20.7	—30.1	13.3				

59.3 wt. % C_2H_5OH.

F. pt.	Gms. C_6H_6 per 100 gms. sat. sol.	F. pt.	Gms. C_6H_6 per 100 gms. sat. sol.	F. pt.	Gms. C_6H_6 per 100 gms. sat. sol.
— 6.7	5.2	—18.1	3.1	—26.2	2.2
—12.5	3.9	—22.5	2.6	—30.1	1.9

Data for the freezing-points of mixtures composed of benzene-toluene (3 : 1 by volume) alcohol and water are given by Ormandy and Craven, 1921.

Data for the solubility of mixtures of benzene and petrol in aqueous 92 wt. per cent ethyl alcohol at 20° are given by Ormandy and Craven, 1921.

EQUILIBRIUM IN THE SYSTEM BENZENE, METHYL ALCOHOL AND WATER AT 25°. (Barbaudy, 1926 *a*.)

A diagram of the isotherm of clouding is given and the following results for three pairs of conjugated layers.

Aqueous Layer. Gms. per 100 gms. sat. sol.				Benzene Layer. Gms. per 100 gms. sat sol.			
CH_3OH.	C_6H_6.	H_2O.	$d_{\frac{25}{4}}$.	CH_3OH.	C_6H_6.	H_2O.	$d_{\frac{25}{4}}$.
60.8	9.8	29.4	0.8718	4.05	95.67	0.28	0.87003
61.5	11.4	27.1	0.8675	4.22	95.48	0.30	0.86978
61.0	10.2	28.8	0.8700	4.09	95.63	0.28	0.8700

100 gms. anhydrous formic acid dissolve 15.14 gms. C_6H_6 at 25°. (Gordon and Reid, 1922.)

FREEZING-POINTS OF MIXTURES OF BENZENE AND METHYL ALCOHOL. (Ferrakis, 1925.)

t° of cryst.	Mols. C_6H_6 per 100 mols. of Mixture.	t° of cryst.	Mols. C_6H_6 per 100 mols. of Mixture.	t° of cryst.	Mols. C_6H_6 per 100 mols. of Mixture.
5.40	100.00	—0.10	42.57	—11.50	16.45
3.25	92.16	—1.35	36.67	—17.00	13.67
3.00	84.22	—3.20	31.00	—23.00	9.86
2.40	75.00	—4.90	27.18	—46.00	7.07
2.10	63.08	—7.60	22.98	—67.0	4.93
1.85	57.32	—9.70	19.39	—94.0	0.00
1.40	49.39				

The author also gives tables and curves for benzene and normal butyl alcohol and for benzene and iso-propyl alcohol.

FREEZING-POINTS OF MIXTURES OF BENZENE AND NITROBENZENE SATURATED WITH WATER. (Simpson and Jones, 1919.)

t° of freezing.	Gms. C_6H_6 per 100 gms. mixture.	t° of freezing.	Gms. C_6H_6 per 100 gms. mixture.	t° of freezing.	Gms. C_6H_6 per 100 gms. mixture.
—2.90	10.0	+0.34	6.0	3.48	2.0
—2.08	9.0	1.14	5.0	4.34	1.0
—1.26	8.0	1.90	4.0	5.22	0.0 (= wet Nitro-benzene)
—0.46	7.0	2.66	3.0		

Freezing-point data for mixtures of benzene and nitrobenzene are also given by Linard, 1925.

FREEZING-POINTS OF MIXTURES OF BENZENE AND ETHYL ETHER. (Yamamura, 1926.)

t° of freezing.	Mol. per cent C_6H_6 in mixture.	t° of freezing.	Mol. per cent C_6H_6 in mixture.	t° of freezing.	Mol. per cent C_6H_6 in mixture.
5.1	100.0	—33.0	50.4	— 94.0	12.3
1.7	94.9	—36.9	45.0	—105.0	9.6
0.4	93.0	—43.4	40.4	—106.0	8.7
— 4.3	85.1	—48.0	35.9	—115.5	7.6
— 4.8	84.0	—52.5	30.3	—118.5	7.3
—11.2	74.9	—61.3	25.5	—126.5	5.2
—14.9	69.4	—71.7	19.7	—126.5	5.1
—18.6	64.9	—74.5	18.0	—125.0	2.9
—22.6	60.5	—79.0	17.7	—124.5	2.4
—27.0	55.1	—88.5	14.9	—123.5	0.0 = unstable form of $(C_2H_5)_2O$

FREEZING-POINT DATA FOR MIXTURES OF BENZENE AND TOLUENE.
(Robert, 1919.)

f. pt.	Per cent C_6H_6.	f. pt.	Per cent C_6H_6.	f. pt.	Per cent C_6H_6.	f. pt.	Per cent C_6H_6.
5.5....	100	—12.8...	70.0	—39.6...	40.0	—80.0..	15
2.8....	95	—16.5...	65	—45.4...	35	—99.8..	12
0.0....	90	—20.5...	60	—51.8...	30	—98,0..	10
—2.5....	85	—24.8...	55	—58.0...	25	—96.0..	5
—6.0....	80	—29.4...	50	—67.4...	20	—94.5..	0 (=$C_6H_5CH_3$)
—9.5....	75	—34.3...	45				

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given for mixtures of benzene and the following compounds :

Carbon Tetrachloride (Linard, 1925.)
Nitro benzene »
Ethylene dibromide »
Hydrobromic acid (Maas and Russell, 1918.)
Sulfur dioxide (Mazzetti and De Carli, 1926.)
Urethan (Puschin, 1925.)
p Nitro toluene (Linard, 1925.)
p Toluidine (Linard, 1925.)
Toluidine (Dessart, 1926.)
m Nitro toluidine »
m Xylene (Nakatsuchi, 1926.)
Pentane and iso pentane (Ormandy and Craven, 1926.)
Heptane
Hexane

Di Bromo **BENZENE** (Para) $C_6H_4Br_2$.

SOLUBILITY OF DIBROMOBENZENE IN SEVERAL SOLVENTS. (Mortimer, 1923.)

	Mols. *p* $C_6H_4Br_2$ per 100 mols. saturated solution in :					
t°.	C_6H_6.	$C_6H_5CH_3$.	CCl_4.	$C_6H_5NO_2$.	$C_6H_5NH_2$.	C_6H_5OH.
0.....	11.0	10.5	7.9	6.9	3.3	–
20.....	20.2	19.7	15.9	14.4	8.5	–
40.....	34.9	34.3	29.8	27.9	19.7	1.7
60.....	55.7	55.1	51.1	49.1	39.6	28.6
80.....	84.5	84.0	–	81.1	77.6	72.0

100 gms. methyl formate dissolve 28.4 gms. *p* $C_6H_4Br_2$ at 25°. (Kröber, 1919.)

Chloro **BENZENE** C_6H_5Cl

RECIPROCAL SOLUBILITY OF CHLORO BENZENE AND AQUEOUS ETHYL ALCOHOL.
(Rossett, Marange and Vinter, 1923.)

The temperatures were determined at which given mixtures just became clear or cloudy while being stirred in a test tube.

	Composition of mixture				Composition of mixture	
t° of clouding.	cc. of C_6H_5Cl.	+	5 cc. of aq. C_2H_5OH of.	t° of clouding.	cc. of C_6H_5Cl.	+ 5 cc. of aq. C_2H_5OH of.
66.....	10		87°	28.....	11	89°.8
34.5.....	10		88°.9	38.....	12	89°.8
19.5.....	10		89°.8	44.....	13	89°.8
7.5.....	10		90°.7	52.....	14	89°.8
				60.....	15	89°.8

A few determinations are also given for mixtures of chlorobenzene + benzene in aqueous alcohol.

Dichloro **BENZENE** (Para) $C_6H_4Cl_2$.

RECIPROCAL SOLUBILITY OF PARA DICHLORO BENZENE AND SULFUR.
(Bruni and Pelizzola, 1921.)

Initial temp. of cryst.	Gms. $C_6H_4Cl_2$ *p* per 100 gms. mixture.	Initial temp. of cryst.	Gms. $C_6H_4Cl_2$ *p* per 100 gms. mixture.	Initial temp. of cryst.	Gms. $C_6H_4Cl_2$ *p* per 100 gms. mixture.
52.9.....	100.0	79.6.....	85	96.5.....	40
52.6.....	99	86.6.....	80	97.4.....	30
52.2.....	97	94.6.....	70	98.4.....	25
51.0 (Eutec.)..	–	97.1.....	60	99.05.....	20
51.5.....	95	96.8.....	55	101.4.....	10
67.8.....	90	96.9.....	50	107.2.....	5
				113.....	0 (=pure S)

100 gms. para cymene dissolve 2.93 gms. **Hexachloro Benzene** at 23°.5, 16.77 gms. at 100° and 106.95 gms. at 176°. (Wheeler, 1920.)

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given for the following systems :

Bromobenzene	+ Nitrogen peroxide (Pascal, 1922.)					
p Dibromobenzene	+ *p* Dichlorobenzene	— Alcohol	Meyer, 1922	Smits, 1926		
m Bromo nitrobenzene	— *m* Chloro nitro benzene	Ritzau, 1924	Pushin, 1926.			
p Brom iodo benzene	+ *p* Diiodo benzene	(Rheinboldt and Kirchensen, 1926)				
p Chlor iodo benzene	+ *p* »	»	»	»	»	
Chloro benzene	+ Ethylene dibromide (Linard, 1925.)					
» »	+ *o* Chloro toluene	»	»			
o Chloro nitro benzene	+ *m* Chloro nitro benzene	Kohman, 1925				
o » » »	+ *p* »	»	»	»	»	
p » » »	+ *p* »	»	»	»	»	
m » » »	+ *p* »	»	»	+ *o* Chloro nitro benzene (Kohman, 1925.)		
1.2.4 Chloro nitro benzene	+ α Naphthylamine	Gera, Marcellino and Curti, 1926				
1.4 Dichloro 2.5 dinitro benzene	— 2.6 Dinit. benzene	Macleod, Pfund and Kilpatrick, 1922				
2.4 Dinitro chloro benzene	— Benzantial doxime	Brady and Truszkowski, 1925				
» » » »	+ *o* Hydroxybenzantialdoxime	»	»			
» » » »	+ *o* Methoxy	»	»	»	»	
» » » »	+ *p*	»	»	»	»	
» » » »	+ *p*	» benz synal doxime	»	»	»	

Ethyl, Propyl etc. BENZENES.

Freezing-point lowering data are given for the following systems :

Ethyl benzene	+ Hydrobromic Acid	(Maass and Russell, 1918.)
Propyl benzene	+ » »	Maass, Boomer and Morrison, 1923.
Triphenyl benzene	+ Triphenyl triazine	(Pascal, 1925.)
» »	+ Methyl diphenyl triazine	» »
Benzene ethyl tricarboxylate	— Triazine ethyl tricarboxylate	Pascal, 1925

Nitro BENZENE $C_6H_5NO_2$.

Solubility of Nitrobenzene in Several Solvents. von Euler and Svanberg, 1917, 1924.

Solvent.	Gms. $C_6H_5NO_2$ per 100 cc. solvent.	Solvent.	Gms. $C_6H_5NO_2$ per 100 cc. solvent.
Water	0.18	1.0*n* Aq. NH_3 benzoate	0.29
1.0*n* Aq. Na butyrate	0.19	1.0*n* Aq. Na phthalate	0.13
1.0*n* Aq. Na isovalerate	0.17	1.0*n* Aq. Na picrate	0.25
1.0*n* Aq. aniline nitrate	0.28	1.0*n* Aq. nitric acid	0.29
1.0*n* Aq. picoline nitrate	0.53	2.0*n* Aq. K valerate	0.19

Freezing-Points of Mixtures of Nitrobenzene and Compounds Commonly Associated with it as Impurities. Simpson and Jones, 1919.

In each case the freezing-point of mixtures, after saturation with water, was determined.

Wt. per cent $C_6H_5NO_2$ in mixtures.	Freezing-Points of Binary mixtures of $C_6H_5NO_2$ with						
	Paraffine.	CS_2.	C_6H_6.	*m* $C_6H_4(NO_2)_2$.	$C_6H_5CH_3$	*o* $C_6H_4(CH_3)NO_2$.	*p* $C_6H_4(CH_3)NO_2$.
100...	5.22	5.22	5.22	5.22	5.22	5.22	5.22
99...	4.53	4.30	4.34	4.78	4.45	4.74	4.67
98...	3.85	3.43	3.48	4.35	3.69	4.25	4.14
97...	3.20	2.60	2.66	3.90	3.05	3.71	3.59
96...	2.62	1.92	1.90	3.42	2.43	3.18	3.06
95...	2.05	1.23	1.14	2.90	1.78	2.62	2.52
94...	1.53	0.53	0.34	2.41	1.11	2.07	2.00
93...	1.03	−0.17	−0.46	1.94	−0.44	1.55	1.48
92...	0.54	−0.89	−1.26	1.47	−0.24	1.04	0.95
91...	0.04	−1.61	−2.08	1.02	−0.94	0.52	0.36
90...	−0.46	−2.36	−2.90	0.55	−16.4	0.00	−0.22

Solubility of Dinitrobenzene in Concentrated Aqueous Solutions of Sulfuric Acid. (Hough, Savage and van Marle, 1920.)

The results are given only in the form of a Chart. The following approximate values were read from the published curve.

	Gms. $C_6H_4(NO_2)_2$ per 100 gms. sat. sol. in				Gms. $C_6H_4(NO_2)_2$ per 100 gms. sat. sol. in		
t°.	70 % H_2SO_4.	80 % H_2SO_4.	90 % H_2SO_4.	t°.	70 % H_2SO_4.	80 % H_2SO_4.	90 % H_2SO_4.
0....	0.5	1.3	7.0	50....	0.9	2.1	9.8
10....	0.6	1.35	7.2	60....	1.0	2.6	11.1
20....	0.7	1.5	7.5	70....	1.3	3.2	13.1
25....	0.75	1.55	7.75	80....	1.7	3.9	15.5
30....	0.8	1.6	8.0	90....	2.0	4.7	18.2
40....	0.85	1.8	8.8	100....	2.8	6.2	22.1

Solubility of Meta Dinitrobenzene in Ethyl Acetate.

(Moesveld, 1917, 1918; Cohen and Moesveld, 1919.)

The determinations were made with the greatest possible accuracy. Constant agitation in a thermostat was employed and all precautions taken to insure the purity of the materials and accuracy of the analyses. The results are given to the third place of decimals.

t°.	Gms. *m* $C_6H_4(NO_2)_2$ per 100 gms. sat. sol.	t°.	Gms. *m* $C_6H_4(NO_2)_2$ per 100 gms. sat. sol.	t°.	Gms. *m* $C_6H_4(NO_2)_2$ per 100 gms. sat. sol.
0.02....	17.89	12.5.....	23.46	25.0.....	30.85
2.48....	18.93	15.0.....	24.79	27.5.....	32.61
5.0.....	19.94	17.5.....	26.17	30.0.....	34.44
7.5.....	21.02	20.0.....	27.64	32.5.....	36.39
10.0.....	22.21	22.5.....	29.18	35.0.....	38.40

In addition to the above determinations, which were made at the ordinary pressure, results at pressures up to 480 atmospheres are given. These show a diminution of solubility at 30° from 34.44 gms. to 29.567 gms. per 100 gms. sat. sol. at a pressure of 480 atmospheres.

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given for the following systems containing nitrobenzene and 1.3.5 trinitrobenzene.

Nitro Benzene	– Carbon tetrachloride	Linard, 1925.
	+ Cyclohexane	» »
	+ Ethylene dibromide	» »
	– *m* Dinitro benzene	(Lehmstedt, 1918.
	⊢ A mixture of *o*, *m*, *p* Dinitro benzene	» »
	+ Hexane	(Hartenberg, 1926.)
	+ Quinone	(Kremann, Satter, Sitte and Strzelba, 1922.
	⊢ » + Phenol	» » » » »
	⊢ » + α Naphthylamine	» » » » »
	+ » + β »	» » » » »
1.3.5 Trinitro Benzene	⊢ Carbazole	(Kremann and Strzelba, 1921.)
	⊢ Triphenyl carbinole	(Kremann, Hohl and Müller II, 1921.)
	⊢ α Naphthylamine	(Kremann and Grasser, 1916.)
	⊢ β »	Kremann and Grasser, 1916; Rheinboldt and Kircheisen, 1926; Rheinboldt, Henning and Kircheisen, 1925.)
	+ *o* Phenylene diamine	(Kremann and Mastermann, 1923.)
	+ *m* » »	» » »
	⊢ *p* » »	» » »
	⊢ Styphnic acid	(Efremov, 1919 *a*.)

Freezing-point lowering data are given for the following systems containing *o*, *m* and *p* dinitrobenzene.

o Dinitro Benzene	+ Carbazole	(Kremann and Strzelba, 1921.)
	+ Triphenyl carbinol	(Kremann, Hohl and Müller II, 1921.
	+ *m* Dinitro benzene	(Andrews, 1925.)
	+ *p* » »	» » »
	+ *m* Amino phenol	(Kremann, Lüpfer and Zawodsky, 1920.)
	+ α Naphthylamine	(Kremann and Grasser, 1916.)
	+ β »	» » »
	+ *o* Phenylene diamine	(Kremann and Strohschneider, 1918.)
	+ *m* » »	» » »
	+ *m* Dinitro toluene	(Bogojovlewski, 1918.)
	+ α Trinitro toluene	» »
	+ *p* Toluidine	(Kremann and Petritschek, 1917.)
	+ Urea	» » »
m Dinitro Benzene	+ Carbazole	(Kremann and Strzelba, 1921.)
	+ Triphenyl carbinol	(Kremann, Hohl and Müller II, 1921.)
	+ *p* Dinitro benzene	(Andrews, 1925.)
	+ *m* Amino phenol	(Kremann, Lupfer and Zawodsky, 1920.)
	— Naphthalene	(Kitran, 1924.)
	+ α Naphthylamine	(Kremann and Grasser, 1916.
	+ β »	» » »
	+ β Naphthol	(Giua and Marcellino, 1020.)
	+ β Naphtholmethylicether	» » »
	+ Hydroquinol	» » »
	+ *o* Phenylene diamine	(Kremann and Stroschneider, 1918.)
	+ *m* » »	» » »
	+ *p* » »	» » »
	+ α Trinitro toluene	(Bogojovlewsky, 1918.)
	+ *p* Toluidine	(Kremann and Petritschek. 1917.)
	+ Urea	» » »
	+ Urethan	(Pushin and Fioletova, 1922.)
p Dinitro Benzene	+ Carbazole	(Kremann and Strzelba, 1921.)
	+ Triphenyl carbinol	(Kremann, Hohl and Müller II, 1921.)
	+ α Naphthylamine	(Rheinboldt, Henning and Kirscheisen, 1925; Kremann and Grasser, 1916.)
	+ β »	(Rheinboldt, Henning and Kirscheisen, 1925; Kremann and Grasser, 1916.)
	+ *p* Toluidine	(Kremann and Petritschek, 1917.)
	+ Urea	» » »
	+ *o* Phenylene diamine	(Kremann and Strohschneider, 1918.)
	+ *m* » »	» » »
	+ *p* » »	» » »

BENZENE Sulfonic Acid Ethyl Ester, $C_6H_5SO_2.OC_2H_5$.

SOLUBILITY IN WATER AND IN SEVERAL AQUEOUS SOLUTIONS AT 25°.

(Karlsson, 1925.)

Solvent.	Gms. mols. $C_6H_5SO_2.OC_2H_5$ per liter sat. sol.	Solvent.	Gms. mols. $C_6H_5SO_2.OC_2H_5$ per liter sat. sol.
Water	0.00739	0.5 *n* aq. NaCl	0.00452
0.15 *n* aq. NaOH	0.00624	0.1 »	0.00663
0.30 »	0.00514	0.02 *n* aq. Na acetate	0.00702
0.49 »	0.00481	0.05 »	0,00664
0.97 »	0.00367	0.02 » + 0.2 *n* CH_3COOH	0.00712
1.51 »	0.00260	0.0187 *n* aq. $C_6H_5SO_3H$	0.00737
1.58 »	0.00229	0.0378 *n* »	0.00733
2.06 »	0.00208		

BENZENE Sulfonic Acid 1100

BENZENE Para Amino Sulfonic Acid, *p* $C_6H_4.NH_2.SO_3H$.

100 gms. H_2O dissolve 1.0 gm. *p* amino benzene sulfonic acid at 20°, 1.45 gms. at 30° and 1.95 gms. at 40°. (Yajnik, Jain and Nath, 1925.)

BENZIDINE $NH_2.C_6H_4.C_6H_4.NH_2$.

100 gms. abs. Ethyl Alcohol dissolve 7.68 gms. Benzidine at 20-25°. (Pucher and Dehn, 1921.)
100 gms. Quinoline » 43.07 » » » »
100 gms. Equi. Mol. Mixture of C_2H_5OH and Quinoline dissolve 47.23 gms. Benzidine at 20-25° (Pucher and Dehn, 1921.)

Freezing-point lowering data for mixtures of benzidine and Michler's ketone are given by Pfeiffer, 1924.

BENZIDINE HELIANTHATE

1000 cc. H_2O dissolve 0.245 gms. of the salt at 20–25°. (Stark and Dehn, 1918.)

BENZIDINE SULFATE $NH_2.C_6H_4.C_6H_3.NH_2SO_3H$.

Solubility of Benzidine Sulfate in Water. (Bisson and Christie, 1920.)

t°.	0°.	25°.	50°.	80°.
Gms. Benzidine Sulfate per liter	0.049	0.098	0.141	0.290

BENZILIC ACID $(C_6H_5)_2.C(OH).COOH$.

Solubility of Benzilic Acid in Aqueous Solutions of Hydrochloric Acid at 25°. (Knox and Richards, 1919.)

Gm. equivalents per liter		Gm. equivalents per liter		Gm. equivalents per liter	
HCl.	$C_{14}H_{12}O_3$.	HCl.	$C_{14}H_{12}O_3$.	HCl.	$C_{14}H_{12}O_3$.
0.00	0.00769	4.440	0.00182	8.803	0.00167
1.537	0.00332	5.934	0.00172	10.25	0.00195
2.977	0.00233	7.356	0.00150	11.69	0.00217

Distribution of Benzilic Acid at 25° Between: (Smith, 1921-1922.)

Water and Chloroform. Millimols. $C_{14}H_{12}O_3$ per liter			Water and Ether. Millimols. $C_{14}H_{12}O_3$ per liter			Water and Xylene. Millimols. $C_{14}H_{12}O_3$ per liter		
H_2O layer (C_4).	$CHCl_3$ layer (C_3).	$\frac{C_3}{C_4}$.	H_2O layer (C_4).	Ether layer (C_3).	$\frac{C_3}{C_4}$.	H_2O layer (C_4).	Xylene layer (C_3).	$\frac{C_3}{C_4}$.
0.2305	0.2885	1.25	0.050	0.83	16.60	0.448	0.133	0.30
0.460	0.96	2.08	0.0775	1.55	20.00	0.757	0.363	0.479
0.604	1.75	2.74	0.1200	2.72	22.65	1.029	0.643	0.625
			0.1600	4.44	27.7	1.252	0.975	0.788
			0.300	9.22	30.7			

Freezing-point data for mixtures of *benzimidazol* + Pyramidon are given by Pfeiffer and Angern, 1926.

BENZOIC ACID C_6H_5COOH.

Solubility of Benzoic Acid in Water.

t°.	Gms. mols. C_6H_5COOH per liter.	Gms. C_6H_5COOH per liter.	Authority.
18.....	0.0246 (prob. high)	3.00	(von Euler and Löwenhamm, 1916.)
23.5.....	–	3.20	(Schilow and Lepin, 1922.)
25.....	0.0276	3.37	(Kendall and Andrews, 1921.)
25.....	0.02781	3.397	(Larsson, 1926.)
25.....	0.0280	3.42	(von Euler and Löwenhamm, 1916.)

Data for the solubility of benzoic acid in water (determined by the synthetic method), agreeing satisfactorily with the results of Alexejew, are given by Sidgwick and Ewbank, 1921 *a*.

Solubility of Benzoic Acid in Aqueous Solutions of Salts at 25°. (Larsson, 1926.)

Salt Solution.	Gms. mols. C_6H_5COOH. per liter.	Salt Solution.	Gms. mols. C_6H_5COOH. per liter.
0.01605 *n* Sodium Oxalate...	0.0370	0.025 *n* Sodium Fumarate...	0.0451
0.0321 » » » ...	0.0428	0.05 » » » ...	0.0557
0.0642 » » » ...	0.0505	0.025 *n* Sodium (l) Malate ..	0.0515
0.025 *n* Sodium Succinate..	0.0608	0.05 » » » ...	0.0679
0.05 » » » ..	0.0857	0.025 *n* Sodium (d) Tartrate .	0 0417
		0.05 » » » ..	0.0507

Solubility of Benzoic Acid at 25° in Aqueous Solutions of : (Kendall and Andrews, 1921.)

Hydrochloric Acid.

Gm. mols. per liter		Gm. mols. per liter	
HCl.	C_6H_5COOH.	HCl.	C_6H_5COOH.
0.0	0.0276	3.308	0.0153
0.2828	0.0254	4.410	0.0140
0.6308	0.0235	5.238	0.0130
1.180	0.0211	7.172	0.0113
1.848	0.0185	9.522	0.0109

Nitric Acid.

Gm. mols. per liter		Gm. mols. per liter	
HNO_3.	C_6H_5COOH.	HNO_3.	C_6H_5COOH.
0.0208	0.0272	1.019	0.0271
0.0807	0.0269	1.623	0.0272
0.1351	0.0268	2.430	0.0275
0.2021	0.0268	3.880	0.0277
0.5514	0.0270	4.784	0.0284

One liter of aqueous solution simultaneously saturated with benzoic and salicylic acids at 18° contains 0.0235 gm. mols. C_6H_5COOH and 0.0116 gm. mols. $C_6H_4.OH.COOH$. 1.2. (von Euler and Löwenhamm, 1916.)

The System Benzoic Acid, Sodium Benzoate and Water at 14°. (Landrieu, 1920.)

The curve representing this system consists of three branches. The first branch corresponds to solutions saturated with benzoic acid. The second represents solutions saturated with the double salt, $C_6H_5COONa.2C_6H_5COOH$ and the third, solutions saturated with sodium benzoate. At the triple points the solutions have the following composition :

Gms. per 100 gms. sat sol.		Solid Phase.
C_6H_5COOH.	C_6H_5COONa.	
1.25	35.3	$C_6H_5COOH + C_6H_5COONa.2C_6H_5COOH$
1.46	40.4	$C_6H_5COONa +$ »

Distribution of Benzoic Acid at 19° Between : (Schilow and Lepin, 1922.)

Water and Benzine.

Gms. C_6H_5COOH per 100 cc.	
H_2O layer.	Benzine layer.
0.0568	0.0376
0.1015	0.0996
0.1628	0.254
0.237	0.568
0.329	0.998*

Water and Benzene.

Gms. C_6H_5COOH per 100 cc.	
H_2O layer.	C_6H_6 layer.
0.0718	0.538
0.1078	1.146
0.1560	2.285
0.2260	4.84
0.329	9.70*

Water and Toluene.

Gms. C_6H_5COOH per 100 cc.	
H_2O layer.	$C_6H_5CH_3$ layer.
0.0844	0.658
0.1285	1.590
0.1580	2.388
0.1810	3.019
0.2090	4.220
0.2755	6.970*

Water and Xylene.

Gms. C_6H_5COOH per 100 cc.	
H_2O layer.	$C_6H_4(CH_3)_2$ layer.
0.1135	1.043
0.1720	2.500
0.2230	4.325
0.2825	6.170*

Water and Anisol.

Gms. C_6H_5COOH per 100 cc.	
H_2O layer.	$C_6H_5OCH_3$ layer.
0.0627	0.942
0.1020	1.965
0.1495	3.520
0.2330	7.600
0.2870	11.15*

Water and Amyl Ether.

Gms. C_6H_5COOH per 100 cc.	
H_2O layer.	$(C_5H_{11})_2O$ layer.
0.0634	0.717
0.119	1.508
0.179	2.390
0.341	5.17

Water and Ethyl Ether.

Gms. C_6H_5COOH per 100 cc.	
H_2O layer.	$(C_2H_5)_2O$ layer.
0.0765	5.38
0.158	11.45
0.190	14.05
0.268	21.20
0.460	35.40*

Water and Phenetol.

Gms. C_6H_5COOH per 100 cc.	
H_2O layer.	$C_6H_5.OC_2H_5$ layer.
0.1064	1.77
0.1733	3.51
0.3110	9.39*

* Solid C_6H_5COOH present.

Distribution of Benzoic Acid at 25° Between : (Smith, 1921-1922.)

Water and Ethyl Ether.

Millimols. C_6H_5COOH per liter		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{(C_2)}{(C_1)}$
0.0375	0.9125	24.30
0.065	1.625	25.00
0.095	2.385	25.15
0.1575	4.8625	30.85
0.270	8.130	30.15
0.370	13.75	37.80

Water and Xylene.

Millimols. C_6H_5COOH per liter		
H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$
0.737	0.678	0.92
0.794	0.819	1.03
0.842	0.865	1.03
1.568	2.90	1.85
4.19	17.4	4.15

DISTRIBUTION OF BENZOIC ACID AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Chloroform. Millimols. C_6H_5COOH per liter			Water and Benzene. Millimols. C_6H_5COOH per liter		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	C_6H_6 layer (C_2).	$\frac{C_2}{C_1}$.
0.2380	0.5625	2.36	0.8725	1.525	1.75
0.3025	0.732	2.42	0.925	1.95	2.11
0.396	1.054	2.66	1.300	3.45	2.57
0.599	1.84	3.07	1.725	5.50	3.19
0.675	2.125	3.15	2.80	11.90	4.25
1.137	4.55	3.96	4.00	19.75	4.93

Data showing the influence of temperature upon the distribution of benzoic acid between water and benzene are given by Wosnessensky, 1923.

SOLUBILITY OF BENZOIC ACID IN SEVERAL SOLVENTS. (Mortimer, 1923.)

	Mols. C_6H_5COOH per 100 mols. of saturated solution in					
t°.	Acetone.	Acetophenone.	Phenol.	Nitrobenzene.	Toluene.	Carbon tetrachloride.
0.....	15.8	8.3	–	4.4	3.2	1.7
20.....	20.5	14.4	–	9.2	5.8	4.2
40.....	26.9	23.6	16.9	16.3	13.6	9.4
60.....	36.2	35.9	28.2	27.6	24.3	20.0
80.....	–	51.6	44.2	43.4	40.0	–
100.....	–	71.6	67.0	66.0	64.6	–

SOLUBILITY OF BENZOIC ACID IN BENZENE AND IN TOLUENE. (Chipman, 1924.)

An air jacketed test tube, provided with a stirrer and a thermometer, was used. Weighed amounts of benzoic acid and benzene were introduced and the mixture heated untill entirely homogeneous. It was then cooled with rapid stirring untill a cloud of minute crystals formed, and then warmed slowly with constant stirring untill the cloud of crystals disappeared. The results were plotted and the following values read from the smooth curve.

Results for Benzene.		Results for Toluene.	
t°.	Gms. C_6H_5COOH per 100 gm. sat. sol.	t°.	Gms. C_6H_5COOH per 100 gms. sat. sol.
4.3 (Eutec.).....	5.1	0.0.....	4.44
10.0.....	6.1	10.0.....	5.6
20.0.....	8.95	20.0.....	8.0
25.0.....	10.85	25.....	9.6
30.0.....	13.0	30.....	11.5
40.0.....	18.4	40.....	16.2
50.0.....	25.3	50.....	22.3
60.....	34.1	60.....	30.2
70.....	44.5	70.....	39.7
80.....	55.6	80.....	50.7
90.....	67.3	90.....	62.8
100.....	78.3	100.....	75.1
110.....	88 9	110.....	86.8
121.7.....	100.0	121.7.....	100.0

A series of results for the solubility of benzoic acid in benzene, agreeing satisfactorily with the above, is given by Sidgwick and Ewbank, 1921 *a*. Individual determinations by von Euler and Löwenhamm, and by de Szyszkowski, 1914-1915, also agree with the above. The latter investigator also gives data for the simultaneous solubility of benzoic, salicylic and nitro benzoic acids in dry benzene and in benzene saturated with water. The results of von Euler and Löwenhamm quoted at the bottom of page 135 of the preceding volume of «Solubilities» refer to the temperature 18° and not 25° as reported.

Solubility of Benzoic Acid in Several Solvents.

Solvent.	t°.	Gms. C_6H_5COOH per 100 gms. solvent.	Authority.
Benzene sat. with H_2O	25	12.7	(de Szyszkowski, 1914-1915.)
Chloroform sat. with H_2O	25	15.6	»
Carbon tetrachloride sat. with H_2O	25	4.3	»
Benzine	23.5	1.3	(Schilow and Lepin, 1922.)
Ethyl ether	23.5	27.5	»
p Cymene (b. pt. 176°–176.5)	25	6.5	(Wheeler, 1920.)
Glycerol 86.5 % (d_{20} = 1.2326)	20	1.4	(Holm, 1921-1922.)
» 98.5 % (d_{20} = 1.2645)	20	2.2	»
Olive oil	25	3.96	(Verkade, 1921.)
Cotton seed oil	25	4.22	»
Peanut oil I	25	4.78	»
» » II	25	3.98	»
Cocoanut oil	25	4.98	»
Linseed oil	25	4.27	»
Castor oil	25	14.70	»

Solubility of Benzoic Acid in Ethyl Alcohol Solutions of Urea at 25° and Vice Versa. (Osaka and Ando, 1921.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
C_6H_5COOH.	$CO(NH_2)_2$.	Solid Phase.	C_6H_5COOH.	$CO(NH_2)_2$.	Solid Phase.
36.92	0.00	C_6H_5COOH	45.65	12.12	C_6H_5COOH
37.64	0.72	»	46.23	12.51	$C_6H_5COOH + CO(NH_2)_2$
38.55	1.81	»	43.78	12.15	$CO(NH_2)_2$
39.38	2.64	»	35.06	12.76	»
40.75	4.22	»	25.38	9.41	»
41.56	5.10	»	11.22	7.39	»
42.31	6.11	»	5.06	6.59	»
42.90	7.09	»	0.00	5.82	»
44.68	9.67	»			

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given for mixtures of benzoic acid and each of the following compounds :

Benzanilide (Puschin and Wilowitsch, 1925.)
Benzil (Passerini, 1924.)
m Nitro benzolic aldehyde » »
Naphthalene (Puschin and Wilowitsch, 1925.)
Phenylene diamine » »
Diphenyl amine » (Baskow, 1918.)
Phenacetine (Kitran, 1824.)
Piperonal (Passerini, 1924.)
Quinoline (Baskow, 1918.)
α Naphthylamine, β » » (Kremann, Weber and Zechner, 1925; Baskow, 1918.)
o Phenylene diamine, *m* » », *p* » » (Kremann, Weber and Zechner, 1925.)
Resorcinol (Puschin and Wilowitsch, 1925.)
Ethyl urethan » » »
p Toluidine, Urea (Kremann, Weber and Zechner, 1925.)

Amino BENZOIC ACID (*m*) $C_6H_4.NH_2.COOH$.

Solubility in Water and in Aqueous Solutions of Sodium Chloride and of Potassium Nitrate at 25°. (de Szyszkowski, 1914-1915.)

Normality of Aq. salt solution.	Gm. mols. *m* $C_6H_4.NH_2.COOH$ per 1000 gms. sat. sol. in Aqueous NaCl.	Aqueous KNO_3.
0.0 (= water)	$5.565.10^{-2}$	$5.565.10^{-2}$
0.1	–	5.606 »
0.25	5.670 »	5.797 »
0.5	5.712 »	5.892 »
1.0	5.246 »	5.064 »

Solubility of Ortho, Meta and Para Aldehydo Benzoic Acids in Water.

(Sidgwick and Clayton, 1922.)

Results for *o* $COOH.C_6H_4.CHO$.			Results for *m* $COOH.C_6H_4.CHO$.		Results for *p* $COOH.C_6H_4.CHO$.	
Temp. of solid-liquid equilibrium.	Temp. of liquid-liquid equilibrium.	Gms. *o* $COOH.C_6H_4CHO$ per 100 gms. sat. sol.	Temp. of solid-liquid equilibrium.	Gms. *m* $COOH.C_6H_4CHO$ per 100 gms. sat. sol.	Temp. of solid-liquid equilibrium.	Gms. *p* $COOH.C_6H_4CHO$ per 100 gms. sat. sol.
100.5	–	100.0	175.0	100.0	250.0	100
75.0	–	91.66	140.0	86.76	191.5	79.40
64.5	–	87.20	132.9	81.88	181.5	49.60
58.1	–	81.50	121.5	70.72	158.9	32.46
53.2	39.2	59.48	116.6	58.87	150.9	19.08
51.8	44.0	40.83	114.6	49.45	142.3	10.24
49.9	45.75	29.20	113.5	40.28		
48.92	43.3	20.00	112.3	29.97		
46.1	21.1	9.38	110.7	19.87		
			107.5	11.22		
			99.7	4.91		

Solubility of Ortho, Meta and Para Aldehydo Benzoic Acids in Benzene.

(Sidgwick and Clayton, 1922.)

Results for *o* $COOH.C_6H_4CHO$.		Results for *m* $COOH.C_6H_4.CHO$.		Results for *p* $COOH.C_6H_4.CHO$.	
Temp. of solid-liquid equilibrium.	Gms. *o* $COOH.C_6H_4.CHO$. per 100 gms. sat. sol.	Temp. of solid-liquid equilibrium.	Gms. *m* $COOH.C_6H_4.CHO$ per 100 gms. sat. sol.	Temp. of solid-liquid equilibrium.	Gms. *p* $COOH.C_6H_4CHO$ per 100 gms. sat. sol.
84.0	81.4	175.0	100	250.0	100
77.8	64.09	154.5	73.36	196.0	2.40
75.7	49.50	149 9	56.98	131.9	1.41
73.9	35.88	149.7	43.84	110.0	0.96
72.3	21.87				
66.7	10.16				

Chloro **BENZOIC ACIDS** *o*, *m* and *p* $COOH.C_6H_4.Cl$.

Solubility of Ortho, Meta and Para Chloro Benzoic Acids in Benzene and in Normal Heptane.

(Sidgwick and Ewbank, 1921 *a*.)

	Results for *o* $COOH.C_6H_4.Cl$.		Results for *m* $COOH.C_6H_4.Cl$.		Results for *p* $COOH.C_6H_4.Cl$	
Solvent.	t°.	Gms. *o* $COOH.C_6H_4.Cl$ per 100 gms. sat. sol.	t°.	Gms. *m* $COOH.C_6H_4.Cl$ per 100 gms. sat. sol.	t°.	Gms. *p* $COOH.C_6H_4.Cl$ per 100 gms. sat. sol.
Benzene ...	140.3	100.0	154.5	100.0	241.5	100.0
» ...	129.5	90.9	142.5	94.2	232.5	92.2
» ...	113.9	70.4	125.3	71.15	212.7	72.9
» ...	99.6	50.08	108.0	49.0	194.0	52.5
» ...	82.7	29.81	93.7	30.1	172.5	30.5
» ...	57.7	9.91	65.5	9.67	137.4	10.3
» ...	44.8	5.15	51.2	4.96	119.4	5.3
» ...	26.0	1.98	35.8	2.25	93.6	1.98
n Heptane..	134.7	88.68	147.7	89.82	227.6	76.86
» ..	129.8	68.76	140.1	70.05	218.3	51.30
» ..	126.0	36.89	134.2	50.06	207.2	31.23
» ..	112.8	12.55	128.1	30.60	180.0	10.09
» ..	108.8	10.42	105.8	9.98	165.3	4.96
» ..	94.8	4.61	89.6	4.48	136.1	1.69
» ..	79.0	2.57	72.2	1.92		

1000 cc. H_2O dissolve approximately 0.04 gm. *p* chloro benzoic acid (microbic acid). (Otto, 1917-1925.)

DISTRIBUTION OF ORTHO CHLORO BENZOIC ACID AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Chloroform. Millimols. *o* Cl. C_6H_4COOH per liter of			Water and Ethyl Ether. Millimols. *o* Cl. C_6H_4COOH per liter of			Water and Xylene. Millimols. *o* Cl. C_6H_4COOH per liter of		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.492	0.649	1.320	0.100	1.300	13.001	1.19	0.600	0.505
0.649	1.072	1.655	0.145	2.415	16.65	1.55	0.975	0.630
0.760	1.488	1.955	0.1925	3.7075	19.30	1.75	1.325	0.757
1.075	2.690	2.50	0.250	5.67	22.65	2.30	2.20	0.956
			1.360	9.68	26.80	4.55	7.45	1.63

Freezing-point lowering data for mixtures of *m* chloro benzoic acid + 2.5 dichloro benzoic acid and for 2.5 dichloro benzoic acid + 2.3 dichloro benzoic acid are given by Hope and Riley, 1923.

Iodo **BENZOIC ACID** (*o*) $I.C_6H_4.COOH$.

DISTRIBUTION OF ORTHO IODO BENZOIC ACID AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Chloroform. Millimols. *o* $I.C_6H_4.COOH$ per liter of			Water and Ethyl Ether. Millimols. (*o*) $I.C_6H_4.COOH$ per liter of			Water and Xylene. Millimols. (*o*) $I.C_6H_4.COOH$ per liter of		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.248	0.512	2.06	0.0238	0.505	21.2	0.325	0.175	0.538
0.244	0.493	2.02	0.0400	0.861	21.5	0.60	0.55	0.916
0.287	0.680	2.37	0.0602	1.400	23.2	1.10	2.20	2.00
0.335	0.973	2.90	0.1010	2.640	26.2			
0.473	1.990	4.21						

Hydroxy **BENZOIC ACIDS** *o*, *m* and *p* $OH.C_6H_4.COOH$ (*o* = Salicylic Acid).

SOLUBILITY OF ORTHO, META AND PARA HYDROXY BENZOIC ACIDS IN WATER. (Sidgwick and Ewbank 1921 *a*.)

The determinations were made by the synthetic method. The *p* hydroxy benzoic acid crystallizes with 1 H_2O and the triple point is at 62°.

Results for Ortho Hydroxy Benzoic Acid.		Results for Meta Hydroxy Benzoic Acid.		Results for Para Hydroxy Benzoic Acid.	
t° of solid-liquid equilibrium.	Gms. *o* $OH.C_6H_4COOH$ per 100 gms. sat. sol.	t° of solid-liquid equilibrium.	Gms. *m* $OH.C_6H_4COOH$ per 100 gms. sat. sol.	t° of solid-liquid equilibrium.	Gms. *p* $OH.C_6H_4COOH$ per 100 gms. sat. sol.
159.0 (m. pt.)	100.0	201.3 (m. pt.)	100.0	213.0 (m. pt.)	100.0
131.8	89.75	134.0	70.8	167.0	85.2
119.5	80.0	109.8	49.35	137.5	71.3
109.5 (67.0)	65.4	98.3	33.85	114.0	51.95
107.2 (86.4)	48.18	93.3	25.22	109.5	46.60
106.7 (89.1)	34.02	84.6	14.70	97.0	29.47
105.6 (87.2)	16.82	79.6	9.85	89.6	19.66
101.4 (77.3)	8.02	69.0	6.11	80.1	11.85
97.9	5.27			75.7	9.28
80.0	2.026			65.1	5.22
56.0	0.717			63.0	4.75
50.0	0.557			60.2	4.20
Crit. sol. t° = 8.45				56.0	3.20
				50.9	2.38

The figures in parentheses show the temperature of the liquid-liquid equilibrium.

Solubility of Ortho, Meta and Para Hydroxy Benzoic Acids in Several Solvents. (Sidgwick and Ewbank, 1921 *a*.)

Solvent.	Results for Ortho Hydroxy Benzoic Acid. Gms. *o* OHC_6H_4COOH per 100 gms. sat. sol. t°.		Results for Meta Hydroxy Benzoic Acid. Gms. *m* OHC_6H_4COOH per 100 gms. sat. sol. t°.		Results for Para Hydroxy Benzoic Acid. Gms. *p* OHC_6H_4COOH per 100 gms. sat. sol. t°.	
Ethyl alcohol (99.0 %)	125.2	81.2	160.0	81.7	184.0	82.9
»	85.2	60.4	132.0	61.3	136.5	60.9
»	41.0	40.6	65.0	39.6	67.0	38.75
n Butyl alcohol	121.6	79.2	180.3	84.7	193.8	85.5
»	85.6	48.9	151.2	59.2	167.0	62.4
»	38.0	28.88	115.0	40.8	116.1	39.45
»	24.0	24.36	36.5	20.7	62.0	25.08
»	–	–	–	–	32.5	19.50
Benzene	140.0	81.3	192.15	82.3	206.0	83.0
»	131.5	64.5	185.5	62.3	198.8	61.3
»	114.5	41.1	182.5	41.6	195.7	40.6
»	98.5	20.8	173.0	22.4	191.5	21.0
»	65.0	5.27	162.0	10.54	178.0	10.3
»	44.3	1.92	154.5	5.16	165.2	4.3
»			141.0	2.95	156.9	3.03
»	–	–	122.5	1.23	132.2	1.04
n Heptane	149.5	81.4	197.0	2.0 (liquid)	208.5	1.80 (liquid)
»	142.0	41.6	176.0	0.86 »	197.0	1.60 »
»	134.3	20.15	197.0 (tr. pt.)	–	208.5 (tr. pt.)	–
»	112.4	5.37				
»	92.2	2.09				

Distribution of Para Hydroxy Benzoic Acid Between Water and Ethyl Ether at 25° (Smith, 1921-1922.)

Millimols. *p* $OH.C_6H_4COOH$ per liter of H_2O layer (C_1).	Millimols. *p* $OH.C_6H_4COOH$ per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	Millimols. *p* $OH.C_6H_4COOH$ per liter of H_2O layer (C_1).	Millimols. *p* $OH.C_6H_4COOH$ per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.3125	2.2625	7.23	0.875	7.425	8.50
0.400	3.250	8.13	1.40	12.8	9.15
0.575	5.025	8.72			

Freezing-point lowering data for mixtures of *m* hydroxy benzoic acid and Michler's ketone are given by Pfeiffer, 1924.

Nitro **BENZOIC ACIDS** (*o*), (*m*) and (*p*) $NO_2.C_6H_4COOH$.

Solubility of Ortho, Meta and Para Nitro Benzoic Acids in Water.

(Sidgwick and Ewbank, 1921 *a*: Results below 43°, Yajnik, Jain and Nath, 1925.)

Results for Ortho Nitro Benzoic Acid. Gms. *o* $NO_2.C_6H_4.COOH$ per 100 gms. sat. sol. t°.		Results for Meta Nitro Benzoic Acid. Gms. *m* $NO_2.C_6H_4COOH$ per 100 gms. sat. sol. t°.		Results for Para Nitro Benzoic Acid. Gms. *p* $NO_2.C_6K$ COOH per 100 gms. sat. sol. t°.	
146.8...	100.0	141.4...	100.0	242.4...	100.0
110.4...	90.38	104.8...	89.76	184.8...	79.22
90.5...	79.30	85.4...	79.52	168.6...	59.21
79.5...	59.85	97.7...	60.85 (L)	163.5...	38.30
78.0...	39.92	108.4...	40.31 (L)	158.8...	18.50
77.5...	19.24	107.8...	19.85 (L)	153.0...	9.17
75.3...	9.48	99.3...	9.90 (L)	177.0...	0.88
49.5...	1.85	79.3...	1.57 (L)	42.0...	0.022
42.0...	2.28	42.0...	0.515	35.0...	0.025
35.....	1.30	35.0...	0.418	25.0...	0.028
25.....	0.75	25.0...	0.344		

(L) a second liquid phase separates. Crit. temp. for *m* nitrobenzoic acid, 109°.0 and tr. pt. 76°.8.

Solubility of Ortho, Meta and Para Nitro Benzoic Acids in Aqueous Solutions of Electrolytes at 35°. (Vajnik, Jain and Nath, 1925.)

Saturated solutions of the acids were prepared at 45° and 100 cc. portions placed in flasks containing accurately weighed quantities of the various electrolytes. These were kept in a thermostat at 35° but no mention is made of stirring or agitation during the period of attainment of equilibrium. The acid present was determined by titration with standard alkali. Nothing is said about the separation of the solid phase. This is especially regretable in the case of *p* nitro benzoic acid, which according to the authors' figures, is less soluble with increase of temperature. Also in some cases the reported increase in solubility with increase of concentration of electrolyte, is greater than the amount of acid which could have been present in a mixture made as described

	Results for Ortho Nitro Benzoic Acid.		Results for Meta Nitro Benzoic Acid.		Results for Para Nitro Benzoic Acid.	
Electrolyte used.	Gm. mol. electrolyte per 100 gms. H_2O.	Gm. *o* $NO_2.C_6H_4COOH$ per 100 gms. H_2O.	Gm. mol. electrolyte per 100 gms. H_2O.	Gm. *m* $NO_2.C_6H_4COOH$ per 100 gms. H_2O.	Gm. mol. electrolyte per 100 gms. H_2O.	Gm. *p* $NO_2.C_6H_4COOH$ per 100 gms. H_2O.
$(NH_4)_2SO_4$.	0.0000	1.30	0.000	0.418	0.000	0.025
» .	0.0016	1.245	0.0017	0.3105	0.0031	0.027
» .	0.0030	1.222	0.0030	0.2593	0.0042	0.028
» .	0.0050	1.191	0.0048	0.2616	0.0087	0.029
» .	0.0067	1.163	0.0064	0.2554	0.0102	0.0295
» .	0.0082	1.136	0.0097	0.2446	0.0125	0.029
Na_2SO_4...	0.0014	1.295	0.0020	0.3235	0.0018	0.0269
» ...	0.0033	1.232	0.0032	0.2848	0.0046	0.0289
» ...	0.0053	1.154	0.0051	0.2771	0.0051	0.0306
» ...	0.0071	1.039	0.0073	0.2687	0.0076	0.0309
» ...	0.0078	0.072 (?)	0.0089	0.2616	0.0102	0.0315
K_2SO_4....	0.0015	1.310	0.0016	0.3317	0.0017	0.0272
»	0.0020	1 254	0.0027	0.2987	0.0027	0.0281
»	0.0026	1.181	0.0039	0.2956	0.0047	0.0288
»	0.0045	1.098	0.0048	0.2910	0.0063	0.0295
»	0.0071	0.981	0.0063	0.2848	0.0084	0.0300
NH_4Cl....	0.0046	1.256	0.0036	0.2043	0.0052	0.0346
»	0.0058	1.227	0.0060	0.1950	0.0084	0.0353
»	0.0079	1.199	0.0078	0.1895	0.0103	0.0352
»	0.0094	1.193	0.0100	0.1830	0.0137	0.0343
»	0.0117	1 171	0.0148	0.1672	0.0178	0.0320
Na Cl	0.0041	1 241	0.0070	0.2059	0.0065	0.0358
»	0.0058	1.186	0.0088	0.1903	0.0135	0.0355
»	0.0094	1.126	0.0125	0.1718	0.0152	0.0353
»	0.0131	1.068	0.0171	0.1485	0.0184	0.0347
»	0.0155	1.040	0.0237	0.1223	0.0257	0.0324
K Cl.....	0.0031	1.228	0.0033	0.2337	0.0035	0.0328
»	0.0053	1.213	0.0075	0.2213	0.0049	0.0342
»	0.0069	1.181	0.0116	0.2090	0.0079	0.0361
»	0 0088	1.149	0.0154	0.1981	0.0096	0.0359
»	0.0112	1.024	0.0197	0.1857	0.0143	0.0350
$CaCl_2$.....	0.0015	1.334	0.0023	0.2525	0 0027	0.0348
»	0.0028	1.364	0.0038	0.2368	0.0034	0.0352
»			0.0058	0.2291	0.0067	0.0323
»			0.0085	0.2229	0.0088	0.0283
»			0.0113	0.2403	0.0092	0.0278

SOLUBILITY OF ORTHO, META AND PARA NITRO BENZOIC ACIDS IN AQUEOUS SOLUTIONS OF ELECTROLYTES AT 35°. (*con.*)

	Results for Ortho Nitro Benzoic Acid.		Results for Meta Nitro Benzoic Acid.		Results for Para Nitro Benzoic Acid.	
Electrolyte used.	Gm. mol. electrolyte per 100 gms. H_2O.	Gm. $o\,NO_2.C_6H_4COOH$ per 100 gms. H_2O.	Gm. mol. electrolyte per 100 gms. H_2O.	Gm. $m\,NO_2.C_6H_4COOH$ per 100 gms. H_2O.	Gm. mol. electrolyte per 100 gms. H_2O.	Gm. $p\,NO_2.C_6H_4COOH$ per 100 gms. H_2O.
$SrCl_2$.....	0.0052	1.878	0.0010	0.2650	0.0013	0.0341
»	0.0059	1.332	0.0017	0.2430	0.0024	0.0356
»	0.0075	1.213	0.0025	0.2384	0.0035	0.0366
»			0.0039	0.2348	0.0047	0.0339
»			0.0040	0.2270	0.0055	0.0298
$BaCl_2$	0.0012	1.330 (1.388)	0.0013	0.2615	0.0013	0.0339
»	0.0021	1.365 (1.420)	0.0018	0.2523	0.0021	0.0363
»	0.0029	1.416 (1.485)	0.0024	0.2446	0.0037	0.0382
»	0.0040	1.464 (1.510)	0.0033	0.2399	0.0041	0.0370
»	0.0051	1.419 (1.464)	0.0041	0.2368	0.0053	0.0311
NH_4NO_3..	0.0028	1.313	0.0028	0.2189	0.0047	0.0402
» ..	0.0046	1.332	0.0038	0.1718	0.0085	0.0413
» ..	0.0062	1.337	0.0049	0.1563	0.0103	0.0414
» ..	0.0078	1.298	0.0069	0.1315	0.0137	0.0405
» ..	0.0093	1.252	0.0082	0.1160	0.0165	0.0396
$NaNO_3$...	0.0026	1.318	0.0016	0.2199	0.0036	0.0405
» ...	0.0050	1.314	0.0032	0.1842	0.0070	0.0417
» ...	0.0077	1.297	0.0057	0.1625	0.0094	0.0418
» ...	0.0113	1.277	0.0078	0.1449	0.0112	0.0413
» ...	0.0137	1.250	0.0101	0.1254	0.0144	0.0401
KNO_3	0.0028	1.391	0.0017	0.2548	0.0028	0.0396
»	0.0052	1.355	0.0032	0.1996	0.0052	0.0414
»	0.0088	1.319	0.0052	0.1780	0.0078	0.0423
»	0.0139	1.272	0.0071	0.1563	0.0111	0.420
»	0.0181	1.231	0.0083	0.1408	0.0122	0.0415
$Ca(NO_3)_2$.	0.0017	1.715	0.0016	0.2427	0.0013	0.0393
» .	0.0027	1.688	0.0033	0.2290	0.0022	0.0436
» .	0.0042	1.629	0.0043	0.2215	0.0036	0.0441
» .	0.0050	1.616	0.0050	0.2187	0.0050	0.0430
» .	0.0061	1.570	0.0065	0.2161	0.0063	0.0402
$Sr(NO_3)_2$.	0.0016	1.783	0.0012	0.2363	0.0014	0.0418
» .	0.0025	1.752	0.0023	0.2284	0.0023	0.0445
» .	0.0033	1.711	0.0028	0.2244	0.0031	0.0461
» .	0.0042	1.676	0.0050	0.2161	0.0049	0.0416
» .	0.0055	1.610	0.0061	0.2140	0.0068	0.0337
$Ba(NO_3)_2$.	0.0015	1.830	0.0013	0.2343	0.0008	0.0380
» .	0.0020	1.788	0.0018	0.2336	0.0018	0.0427
» .	0.0024	1.754	0.0024	0.2290	0.0023	0.0447
» .	0.0033	1.677	0.0033	0.2235	0.0032	0.0473
» .	0.0045	1.570	0.0041	0.2202	0.0037	0.0461

Solubility of Ortho and Meta Nitro Benzoic Acids and of 3.5 Dinitro Benzoic Acid in Aqueous Solutions of Hydrochloric Acid at 25°.

(Knox and Richards, 1919.)

Excess of solid was shaken with aqueous solutions of hydrochloric acid for several days in a thermostat. The saturated solutions were analyzed both for dissolved acid and hydrochloric acid. The results are expressed in *equivalent normalities*.

Results for *o* Nitro Benzoic Acid.		Results for *m* Nitro Benzoic Acid.		Results for 3.5 Dinitro Benzoic Acid.	
Normality of		Normality of		Normality de	
HCl.	o $NO_2.C_6H_4.CO\,OH$.	HCl.	m $NO_2.C_6H_4.CO\,OH$.	HCl.	$3.5(NO_2)_2.C_6H_3.CO\,OH$.
0.00.....	0.0470	0.00.....	0.0214	0.000.....	0.00635
1.314....	0.0280	1.416.....	0.0175	1.565.....	0.00398
2.607.....	0.0256	3.310.....	0.0178	2.908.....	0.00470
3.909.....	0.0239	4.308.....	0.0183	4.594.....	0.00583
5.013.....	0.0235	5.953.....	0.0205	5.657.....	0.00690
6.509.....	0.0233	7.044.....	0.0225	7.336.....	0.00841
7.795.....	0.0237	8.380.....	0.0256	8.855.....	0.00965
9.080.....	0.0250	9.793.....	0.0293	10.27.....	0.01095
10.30.....	0.0267	11.54.....	0.0368	11.73.....	0.01240

Solubility of Ortho, Meta and Para Nitro Benzoic Acid in Benzene and in *n* Heptane. (Sidgwick and Ewbank, 1921 *a*.)

Solvent.	Results for Ortho Nitro Benzoic Acid. t°.	Gms. o $NO_2C_6H_4CO\,OH$ per 100 gms. sat. sol.	Results for Meta Nitro Benzoic Acid. t°.	Gms. m $NO_2C_6H_4CO\,OH$ per 100 gms. sat. sol.	Results for Para Nitro Benzoic Acid. t°.	Gms. p $NO_2C_6H_4COOH$ per 100 gms. sat. sol.
Benzene....	128.3	81.0	121.0	79.6	222.0	82.1
»	113.0	50.25	105.0	55.5	201.6	54.8
»	105.8	28.32	89.5	30.54	196.5	33.42
»	90.5	10.0	65.2	9.87	183.4	21.1
»	78.6	5.03	48.0	4.95	164.5	9.45
»	63.0	2.1	33.0	1.95	–	–
n Heptane..	135.0	1.37	123.4	2.07	179.0	11.04
» ..	130.5	1.37 (L)	103.0	1.03	–	–
» ..	139.6 (tr. pt.)		135.0 (tr. pt.)		234.0 (tr. pt.)	

(L) a second liquid layer separates.

Influence of very Slight Traces of Water upon the Solubility of Ortho Nitro Benzoic Acid in Benzene and in Chloroform at 30°.5.

(Cohen and Miyake, 1926.)

Results for Benzene.		Results for Chloroform.	
Thousandths of a Per cent of H_2O in C_6H_6.	Gms. o $NO_2C_6H_4CO\,OH$ per 100 gms. sat. sol.	Thousandths of a Per cent of H_2O in $CHCl_3$.	Gms. o $NO_2C_6H_4CO\,OH$ per 100 gms. sat. sol.
0.0.....	0.35	0.0.....	0.45
37.7.....	0.43	25.6.....	0.51–0.52
66.3.....	0.49	130.2.....	0.56
89.1.....	0.49–0.50	sat.....	0.56
sat.....	0.50		

Solubility of *o* Nitro Benzoic Acid and of 1.3.5 Dinitro Benzoic Acid in Water and in Benzene at 25°. (de Szyszkowski, 1914-1915.)

Compound.	Gm. mols. cmpd. per 1000 gms. sat. solution in Water.	Dry Benzene.	Benzene sat. with H_2O.
o Nitro benzoic Acid....	–	$1.984.10^{-2}$	$2.687.10^{-2}$
1.3.5 Dinitro benzoic Ac..	$6.344.10^{-3}(6.831.10^{-3})$	$4.880.10^{-3}$	$8.676.10^{-3}(9.135.10^{-3})$

1.3.5 dinitrobenzoic acid shows an exceptional tendency to supersaturation. The results in parentheses are for solutions in which the equilibrium was approached from above.

Solubility of 1.3.5 Dinitro Benzoic Acid in Aqueous Solutions of Salts at 25°.

(de Szyszkowski, 1914.)

Normality of aq. salt solution.	Gm. mols. 1.3.5 $(NO_2)_2C_6H_3.COOH$ per 1000 gms. sat. solution in aqueous KCl.	aqueous NaCl.	aqueous KNO_3.
0.0 (= H_2O).....	$6.168.10^{-3}$	$6.168.10^{-3}$	$6.344.10^{-3}$
0.033.....	6.397 »	–	–
0.05.....	6.471 »	–	–
0.10.....	6.581 »	6.412 »	–
0.143.....	6.546 »	–	–
0.25.....	6.540 »	6.365 »	7.499 »
0.50.....	6.470 »	6.161 »	8.095 »
1.00.....	6.147 »	5.389 »	8.913 »
1.75.....	–	–	9.970 »

Solubility of 1.3.5 Dinitro Benzoic Acid at 25° in :

(de Szyszkowski, 1914.)

Aqueous solutions of KCl in presence of C_6H_6.		C_6H_6 in presence of aqueous solutions of KCl.	
Normality of aq. KCl.	Gm. mols. 1.3.5 $(NO_2)_2C_6H_3.COOH$ per 1000 gms. sat. aq. sol.	Normality of aq. KCl in contact with C_6H_6.	Gm. mols. 1.3.5 $(NO_2)_2C_6H_3.COOH$ per 1000 gms. sat. sol. in C_6H_6.
0.0	$6.253.10^{-3}$	0.0	$8.676.10^{-3}$
0.1	6.620 »	0.1	8.470 »
0.25	6.697 »	0.25	8.447 »
0.50	6.589 »	0.50	8.352 »
0.75	6.491 »	0.75	8.320 »
1.00	6.323 »	1.00	8.268 »
2.00	5.611 »	2.00	8.085 »

Distribution of 1.3.5 Dinitro Benzoic Acid Between :

(de Szyszkowski, 1914.)

Water and Benzene at 25°. Gm. mols. 1.3.5 $(NO_2)_2C_6H_3COOH$ per 1000 gms.		Water and Benzene at 40°. Gm. mols. 1.3.5 $(NO_2)_2C_6H_3COOH$ per 1000 gms.		Water and Chloroform at 25°. Gm. mols. 1.3.5 $(NO_2)_2C_6H_3COOH$ per 1000 gms.	
H_2O layer.	C_6H_6 layer.	H_2O layer.	C_6H_6 layer.	H_2O layer.	$CHCl_3$ layer.
$1.009.10^{-3}$	$1.120.10^{-3}$	$2.059.10^{-3}$	$2.462.10^{-3}$	$1.245.10^{-3}$	$0.658.10^{-3}$
1.608 »	1.982 »	3.120 »	3.925 »	1.835 »	1.055 »
3.727 »	4.686 »	4.135 »	5.393 »	3.367 »	2.225 »
4.794 »	6.473 »	6.480 »	9.630 »	5.237 »	4.190 »
6.258 »	8.676 »*	7.536 »	11.610 »	6.273 »	5.158 »*
		10.150 »	17.940 »		

*Both layers were saturated with 1.3.5 Dinitro Benzoic Acid.

Distribution of 1.3.5 Dinitro Benzoic Acid at 25° Between :

(Smith, 1921-1922.)

Water and Chloroform. Millimols. 1.3.5 $(NO_2)_2C_6H_3COOH$ per liter of			Water and Ethyl Ether. Millimols. 1.3.5 $(NO_2)_2C_6H_3COOH$ per liter of			Water and Xylene. Millimols. 1.3.5 $(NO_2)_2C_6H_3COOH$ per liter of		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
1.450	0.975	0.672	0.1325	1.0475	7.9	1.53	1.11	0.72
1.992	1.425	0.715	0.1850	1.815	9.8	2.40	2.10	0.875
2.855	2.38	0.834	0.225	2.655	11.8	3.15	2.95	0.936
4.04	3.71	0.918	0.295	3.885	13.2	4.05	4.50	1.11
			0.365	6.395	17.5			

DISTRIBUTION OF 1.2.4 DINITRO BENZOIC ACID AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Chloroform.

Millimols. $1.2.4\,(NO_2)_2C_6H_3COOH$ per liter of		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
6.78	0.40	0.059
7.85	0.55	0.070
8.60	0.70	0.0815
10.95	1.10	0.100

Water and Ethyl Ether.

Millimols. $1.2.4\,(NO_2)_2C_6H_3COOH$ per liter of		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.67	0.68	0.91
1.15	1.69	1.41
1.45	2.51	1.73
1.79	4.08	2.28
2.195	7.78	3.12

Water and Xylene.

Millimols. $1.2.4\,(NO_2)_2C_6H_3COOH$ per liter of		
H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
6.78	0.40	0.059
7.85	0.55	0.070
8.60	0.70	0.0815
10.95	1.10	0.100

DISTRIBUTION BETWEEN WATER AND BENZENE OF : (de Szyszkowsky, 1915.)

Ortho Nitro Benzoic Acid at :

25°.

Gm. mols. $\times 10^{-3}$ $o\,(NO_2)C_6H_4COOH$ per 1000 gms.	
H_2O layer.	C_6H_6 layer.
5.164	1.068
7.614	1.960
8.496	2.227
9.109	2.460
11.23	3.324
14.03	4.587
21.03	8.174
25.12	10.70
40.72	23.05
43.83	26.50

40°.

Gm. mols. $\times 10^{-3}$ $o\,(NO_2)C_6H_4COOH$ per 1000 gms.	
H_2O layer.	C_6H_6 layer.
6.692	2.140
10.06	3.567
12.91	5.052
16.21	6.90
30.76	16.40
44.10	27.86
56.89	41.02
65.89	51.22
71.91	58.80
76.54	64.25

Meta Nitro Benzoic Acid at :

25°.

Gm. mols. $\times 10^{-3}$ $m\,(NO_2)C_6H_4COOH$ per 1000 gms.	
H_2O layer.	C_6H_6 layer.
2.370	3.385
3.022	4.836
4.794	9.657
6.944	17.20
9.356	27.86
12.01	44.26
16.34	75.50
22.40	135.90

40°.

Gm. mols. $\times 10^{-3}$ $m\,(NO_2)C_6H_4COOH$ per 1000 gms.	
H_2O layer.	C_6H_6 layer.
2.290	3.374
3.23	5.354
5.522	11.15
8.310	20.53
12.28	38.37
19.56	82.43
27.04	147.2
36.23	254.6

DISTRIBUTION OF ORTHO NITRO BENZOIC ACID AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Chloroform.

Millimols. $o\,NO_2C_6H_4COOH$ per liter of		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
2.775	0.45	0.162
5.55	1.55	0.279
6.60	2.05	0.310
8.65	3.35	0.388

Water and Ethyl Ether.

Millimols. $o\,NO_2C_6H_4COOH$ per liter of		
H_2O layer C_1.	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.379	0.663	1.75
0.543	1.413	2.60
0.790	3.035	3.84
0.200	6.96	5.80
0.840	13.08	7.11

Water and Xylene.

Millimols. $o\,NO_2C_6H_4COOH$ per liter of		
H_2O layer (C_1).	$C_6H_4CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
3.925	0.425	0.1080
5.70	0.55	0.0965
7.60	0.70	0.0920
10.30	0.40	0.0874

DISTRIBUTION OF META NITRO BENZOIC ACID AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Chloroform.

Millimols. $m\,NO_2C_6H_4COOH$ per liter of		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.4874	0.600	1.23
0.675	0.975	1.44
0.950	1.625	1.71

Water and Ethyl Ether.

Millimols. $m\,NO_2C_6H_4COOH$ per liter of		
H_2O layer C_1.	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.075	1.250	16.7
0.095	1.875	19.7
0.135	2.995	21.5
0.180	4.260	23.7
0.240	6.812	28.8

Water and Xylene.

Millimols. $m\,NO_2C_6H_4COOH$ per liter of		
H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
1.20	0.850	0.708
1.60	1.375	0.860
2.20	2.10	0.955
3.00	3.35	1.11

DISTRIBUTION AT 25° OF : (Smith, 1921-1922.)

Para Nitro Benzoic Acid Between : Water and Chloroform.

Millimols. $pNO_2.C_6H_4.COOH$ per liter of		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.364	0.400	1.1
0.525	0.687	1.31
0.75	1.175	1.57
1.05	1.975	1.88

Water and Xylene.

Millimols. $pNO_2.C_6H_4.COOH$ per liter of		
H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.3825	0.1750	0.458
0.681	0.4530	0.665
0.725	0.4625	0.638
0.962	0.7375	0.767
1.10	0.950	0.864

1.2.4.6 Trinitro Benzoic Acid. Between Water and Ethyl Ether.

Millimols. 1.2.4.6 $(NO_2)_3.C_6H_2.COOH$ per liter of		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
1.09	0.200	0.182
2.56	0.84	0.328
4.80	2.20	0.458
8.28	5.88	0.710

BENZOIN, Hydro BENZOIN and Desoxy BENZOIN.

SOLUBILITY OF EACH IN CHLOROFORM AND IN CARBON TETRACHLORIDE AT 20°. (Pawlewski, 1914, 1926.)

Compound.	Formula.	Gms. cmpd. dissolved per 100 gms. $CHCl_3$.	CCl_4.
Benzoin	$C_6H_5CH(OH)CO.C_6H_5$	4.01	0.20
Hydrobenzoin	$(C_6H_5.CHOH)_2$	1.60	0.105
Desoxybenzoin	$C_6H_5CH_2COC_6H_5$	28.96	12.13

BENZOHYDROL (Diphenyl Carbinol) $HO.CH(C_6H_5)_2$.

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given by Kremann and Drazil, 1924, for mixtures of benzohydrol and each of the following compounds : hydroquinol, α and β naphthol, α and β naphthylamine, phenol, *o*, *m* and *p* nitrophenol, 1.2.4 dinitrophenol, picric acid, *o* and *p* phenylenediamine, pyrocatechol, pyrogallol, resorcinol. Similar data are given by Böeseken, 1921, for mixtures of benzohydrol and benzophenone and for benzohydrol and phenol-α-naphtylacetone.

BENZOPHENONE $(C_6H_5)CO$.

Freezing-point lowering data are given for mixtures of benzophenone and each of the following compounds :

Hydroquinol	(Kremann and Zechner, 1918.)	Phenol	(Kremann and Zechner, 1918.)
Diphenylamine	(Giua and Cherchi, 1919.)	*o* Nitro phenol	» » »
α Naphthol	(Kremann and Zechner, 1918.)	*m* »	» » »
β »	» » »	*p* »	» » »
α Naphthylamine	(Kremann and Schadinger, 1918.)	Pyrocatechol	» » »
β »	» » »	Pyrogallol	» » »
Picric acid	(Kremann and Markti, 1920.)	Resorcinol	» » ; Pfeiffer, 1924.)
1.2.4 Dinitro phenol	» » »	*p* Toluidine	(Kremann and Schadinger, 1918)

Data for mixtures of dimethyl aminobenzophenone and β naphthol and for mixtures of tetra methyl-*p*-diamido benzophenone (Michler's ketone) and each of the following compounds : α and β naphthol, menthol, α naphthoic acid, β naphthylamine, neroline, *pp'* dimethoxy stilbene, resorcinol and skatol are given by Pfeiffer, 1924. Data for mixtures of Michler's ketone and veronal are given by Pfeiffer and Angern, 1926.

BENZYL AMINE $C_6H_5CH_2.NH_2$.

DISTRIBUTION OF BENZYLAMINE AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Chloroform.

Millimols. $C_6H_5CH_2NH_2$ per liter of		
H_2O layer (C_1),	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.30	3.85	12.9
0.65	9.55	14.7
1.20	19.6	16.3

Water and Ethyl Ether.

Millimols. $C_6H_5CH_2.NH_2$ per liter of		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.675	1.335	1.97
1.10	3.25	2.04
1.85	3.725	2.01
2.85	6.05	2.12
4.55	9.60	2.10

Water and Xylene.

Millimols. $C_6H_5CH_2.NH_2$ per liter of		
H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2),	$\frac{C_2}{C_1}$.
0.81	1.19	1.47
1.58	2.42	1.53
3.35	6.65	1.99
6.32	13.68	2.16

BENZYL ETHYL AMINE $C_6H_5CH_2.NHC_2H_5$.

Reciprocal Solubility of Benzyl Ethyl Amine and Glycerol.

(Parvatiker and Mc Ewen, 1924.)

This pair of compounds has an upper and a lower critical temperature of miscibility, hence the results, when plotted, give a complete circle.

Temp. of miscibility. Lower.	Upper.	Gms. $C_6H_5CH_2.NHC_2H_5$ per 100 gms. sat. sol.	Temp. of miscibility. Lower.	Upper.	Gms. $C_6H_5CH_2.NHC_2H_5$ per 100 gms. sat. sol.
61	177	10.14	51	281	54.89
50	251	18.07	63	277	76.10
50	267	24.48	71	253	82.50
50.1	279	40.06	85	144	87.85

Distribution at 25° of : (Smith, 1921-1922.)

Benzyl Ethyl Amine Between: Water and Ethyl Ether. Millimols. $C_6H_5CH_2NHC_2H_5$ per liter of H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	Benzyl Ethyl Amine Between: Water and Xylene. Millimols. $C_6H_5CH_2NHC_2H_5$ per liter of H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.	Benzyl Ethyl Amine Acid Phthalate* Between Acetone and Glycerol. Millimols. Acid Phthalate per liter of Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
0.145	1.74	12.0	0.103	1.368	13.6	0.70	2.525	0.277
0.230	2.83	12.3	0.141	1.86	13.5	1.30	3.975	0.327
0.365	4.995	13.7	0.35	4.65	13.3	1.80	5.45	0.330
0.56	7.60	13.6	0.70	9.30	13.3	2.55	7.80	0.322
0.92	12.92	14.1	1.40	18.60	13.4	3.65	10.35	0.302

* See Note p. 1301.

BENZYL METHYL AMINE $C_6H_5CH_2.NHCH_3$.

Distribution of Benzyl Methyl Amine at 25° Between : (Smith, 1921-1922.)

Water and Ethyl Ether. Millimols. $C_6H_5CH_2NHCH_3$ per liter of H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	Water and Xylene. Millimols. $C_6H_5CH_2NHCH_3$ per liter of H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.23	1.17	5.08	0.15	0.725	4.83
0.4	2.12	5.17	0.226	1.20	5.30
0.645	3.665	5.69	0.75	5.00	6.66
1.14	5.66	5.84	1.138	8.86	7.80
2.08	12.84	6.17			

BENZYL PALMITATE. STEARATE, SULFIDE, etc.

Solubility in Several Solvents.

Compound.	Formula.	Solvent.	t°.	Gms. cmpd. per 100 gms. solvent.	Authority.
Benzyl Palmitate.....	$C_6H_5CH_2.CH_3(CH_2)_{14}COO$	C_2H_5OH	16	3.30	(Whibey, 1926.)
Benzyl Stearate.....	$C_6H_5CH_2.CH_3(CH_2)_{16}COO$	»	16	0.685	»
Benzyl Sulfide.....	$(C_6H_5CH_2)_2S$	$CHCl_3$	20	133.91	(Pawlewski 1914.)
» »	»	CCl_4	20	73.16	»
Benzyl Camphoroxime.	–	$CHCl_3$	20	93.68	»
» »	–	»	20	18.87	»

BERYLLIUM BROMIDE $BeBr_2$.

100 cc. pyridine dissolve 18.56 gms. $BeBr_2$ at 25°. (Muller, R. 1924.)

BERYLLIUM PerCHLORATE $Be(ClO_4)_2 4H_2O$.

100 gms. sat. sol. of beryllium perchlorate in water contain 59.5 gms. $Be(ClO_4)_2$ at 25°. (Sidgwick and Lewis, 1926.)

BERYLLIUM CHLORIDE $BeCl_2$.

Fusion point data for mixtures of $BeCl_2$ and each of the following compounds are given by Schmidt, 1926. $BaCl_2$, $CaCl_2$, $PbCl_2$, $CdCl_2$, $MgCl_2$, LiCl, NaCl, AgCl and TlCl.

BERYLLIUM OXALATE $BeC_2O_4.3H_2O$.

Solubility of Beryllium Oxalate in Aqueous Solutions in Presence of Beryllium Oxide at 25°. (Sidgwick and Lewis, 1926.)

d_4^{25} of sat. sol.	Gms. per 100 gms. sat. solution. BeC_2O_4.	BeO.	Solid Phase.
1.179	28.20	0.08	$BeC_2O_4.3H_2O$
1.224	31.73	1.31	»
1.259	35.01	2.35	»
1.282	37.17	3.23	»
—	41.69	4.02	»
2.290	38.20	3.52	»

Equilibrium in the System Beryllium Oxalate, Oxalic Acid and Water at 25°. (Sidgwick and Lewis, 1926.)

d_4^{25} of sat. sol.	Gms. per 100 gms. sat. sol. BeC_2O_4.	$H_2C_2O_4$.	Solid Phase	d_4^{25} of sat. sol.	Gms. per 100 gms. sat. sol. BeC_2O_4.	$H_2C_2O_4$.	Solid Phase.
1.178	26.55	1.81	M. C.*	1.168	20.78	7.63	$H_2C_2O_4.2H_2O$
1.187	25.33	4.42	»	1.139	15.79	8.46	»
1.188	25.23	4.79	»	1.112	11.24	9.07	»
1.197	24.49	6.88	»	1.087	7.60	9.52	»
1.184	23.90	7.51	»	1.064	3.45	10.03	»
1.197	24.01	7.46	»	1.043	0.00	10.23	»

* Mixed Crystals of $BeC_2O_4.3H_2O + H_2C_2O_4.2H_2O$.

BERYLLIUM OXIDE BeO.

Solubility in Water. (Remy, 1925; Remy and Kuhlmann, 1924.)

One liter of H_2O dissolves 0.00005 to 0.00020 gm. BeO at about 20°, as determined by electrolytic conductivity of the saturated solution, assuming complete dissociation of the hydroxide.

BERYLLIUM SELENATE $BeSeO_4.4H_2O$.

Solubility of Beryllium Selenate in Aqueous Solutions Containing Beryllium Oxide at 25°. (Sidgwick and Lewis, 1926.)

Gms. per 100 gms. sat. solution. $BeSeO_4$.	BeO.	Solid Phase.
36.22	0.046	$BeSeO_4.4H_2O$
37.05	0.60	»
38.84	1.98	»
40.23	2.98	»
42.11	3.71	»

BERYLLIUM SULFATE $BeSO_4.4H_2O$.

Solubility in Aqueous Solutions Containing Beryllium Oxide at 25°. (Sidgwick and Lewis, 1926.)

d_4^{25} of sat. sol.	Gms. per 100 gms. sat. sol. $BeSO_4$.	BeO.	Solid Phase.	d_4^{25} of sat. sol.	Gms. per 100 gms. sat. sol. $BeSO_4$.	BeO.	Solid Phase.
1.278	29.74	0.0	$BeSO_4.4H_2O$	1.347	34.55	4.26	$BeSO_4.4H_2O$
1.318	31.73	2.16	»	-	34.87	5.02	»
1.327	32.12	2.62	»	-	36.46	6.10	»
	33.86	4.03	»	1.416	37.48	7.73	»

SOLUBILITY OF BERYLLIUM SULFATE IN AQUEOUS SOLUTIONS OF SULFURIC ACID AT 25°. (Britton, 1921.)

Aqueous H_2SO_4		Gms. $BeSO_4$ per 100 gms. sat. sol.	Aqueous H_2SO_4		Gms. $BeSO_4$ per 100 gms. sat. sol.
Normality.	Wt. % H_2SO_4.		Normality.	Wt. % H_2SO_4.	
0.0	0.0 (=H_2O)	29.94	11.10	40.34	5.25
3.39	12.91	20.51	13.23	46.59	3.54
5.01	19.17	15.91	16.70	55.50	2.04
5.89	22.36	13.65	19.23	62.02	0.98
8.66	32.04	8.61	20.70	66.10	0.86

The solid phase was $BeSO_4.4H_2O$ in all cases. The author failed to confirm the results of Wirth, 1913, who reported a solid phase containing $6H_2O$ and obtained values quite different from the above.

SOLUBILITY OF BERYLLIUM SULFATE IN AQUEOUS SOLUTIONS OF POTASSIUM SULFATE AND VICE VERSA, AT 25°. (Britton and Allmand, 1921.)

The original results are given in terms of the percentage composition of the dissolved salts, and grams of water required to dissolve 100 grams of the two salts. They have been calculated to the following form.

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
K_2SO_4.	$BeSO_4$.	Solid Phase.	K_2SO_4.	$BeSO_4$.	Solid Phase.
1.97	28.33	$BeSO_4.4H_2O$	15.77	10.34	1.1.2
3.06	28.19	»	16.78	13.45	»
4.78	26.67	» + 1.1.2	17.75	10.74	»
4.64	24.01	1.1.2	18.42	10.91	» + K_2SO_4
6.14	13.78	»	16.51	8.93	K_2SO_4
7.77	11.09	»	13.39	5.20	»
10.60	9.40	»	12.31	3.08	»
11.69	8.93	»	10.75	0.00	»

1.1.2 = $K_2SO_4.BeSO_4.2H_2O$.

BERYLLIUM SULFONATES.

SOLUBILITY OF EACH IN WATER AT 25°.

Compound.	Formula.	Gms. anhydrous compd. per 100 gms. sat. sol.	Authority.
Beryllium benzene sulfonate...	$Be(C_6H_5SO_3)_2.4H_2O$	53.8	(Sidgwick and Lewis, 1926.
Beryllium *p* toluene sulfonate.	$Be(C_7H_7SO_3)_2.4H_2O$	39.2	»

BISMUTH OxyCHLORIDE BiOCl.

EQUILIBRIUM IN THE SYSTEM BISMUTH OXIDE, HYDROCHLORIC ACID AND WATER.

Results at 18° (Jellinek and Kühn, 1923.)

Mols. per 100 mols. H_2O			Results at 25° (Waris, 1925. Gms. per 100 gms. sat. sol.		
HCl.	Bi_2O_3.	Solid Phase.	HCl.	Bi_2O_3.	Solid phase.
0.71	0.0018	BiOCl	2.50	0.6	BiOCl
0.74	0.0021	»	4.22	2.60	»
0.89	0.0056	»	10.68	11.40	»
1.18	0.0165	»	13.43	16 41	»
1.28	0.0247	»	18.47	26.42	»
1.36	0.0315	»	30.23	50.74	»
2.20	0.1185	»	33.67	58.72	$BiCl_3$
3.81	0.2835	»	35.14	58.59	»

In the case of the results at 18°, the saturated solutions were prepared by adding sufficient H_2O to solutions of Bi_2O_3 in 0.1 *n* HCl untill BiOCl precipitated, and the mixtures were shaken repeatedly for 18-20 hours. For the results at 25° the constituents were constantly shaken in sealed tubes.

BISMUTH HYDROXIDE $BiO(OH)$.

Solubility of Bismuth Hydroxide in Water. (Almkvist, 1918.)

Ordinary distilled water containing a little CO_3 was used. The $BiO(OH)$ was, therefore, probably converted to basic carbonate. Two liters of the saturated solution were used for the analysis. After constant stirring at approximately 20°, there was found 0.00144 gms. $BiO(OH)$ per liter.

BISMUTH Nitroso Phenyl HYDROXYLAMINE.

100 gms. H_2O dissolve $0.40.10^{-4}$ gm. bismuth nitroso phenyl hydroxylamine at 18°. (Martin.)

BISMUTH LACTATE $C_6H_9O_6Bi.7H_2O$.

The solubility of the hydrate in water at 25°, is 12.6 gms. per 100 gms sat. solution. The solubility of the anhydrous salt is 1.6 gms. per 100 gms. sat. sol. (Moles and Portillo, 1924.)

BISMUTH Oxy NITRATE $BiO.NO_3.H_2O$.

Solubility of Bismuth Oxynitrate in Aqueous Solutions of Nitric Acid at 25°. (Smith, 1923*a*.)

d_{25} of sat. sol.	Gm. mols. per liter sat. sol. Bi.	NO_3.	d_{25} of sat. sol.	Gm. mols. per liter sat. sol. Bi.	NO_3.
1.0005	0.002713	0.1027	1.0422	0.09956	0.6969
1.0067	0.01449	0.2168	1.0643	0.1592	0.9537
1.0228	0.04944	0.4485	1.0912	0.2351	1.2547

BISMUTH OXALATES Neutral $= Bi_2(C_2O_4)_3$, Basic $= Bi(OH)C_2O_4$.

Solubility in Aqueous Solutions of Nitric Acid. (Keschan, 1925.)

A hot saturated solution of bismuth oxalate in 5.0 *n* HNO_3 was diluted with H_2O to desired concentrations. A very slow crystalization occurs. After 3 days the saturated solutions were analyzed and the following results obtained.

Milligrams Equivalents per liter of solution made with :

Normality of the aq. HNO_3.	$Bi_2(C_2O_4)_3$. C_2O_4''.	Bi'''.	$Bi(OH)C_2O_4$. C_2O_4''.	Bi'''.
4.0	25.8	24.7	21.3	46.2
3.0	13.5	12.7	8.5	22.5
2.0	6.0	5.4	3.8	14.2
1.0	1.9	1.5	1.2	3.7
0.5	0.7	0.5	0.4	0.7

BISMUTH SULFIDE, TELLURIDE, MOLYBDATE, etc.

Fusion-point data are given for the following systems.

$Bi_2S_3 + Bi_2Te_3$.	(Amadori, 1918.)
» » + Bi.	»
$Bi_2(MoO_4)_3 + PbMoO_4$.	(Zambonini, 1920.)
$Bi_2(WO_4)_3 + PbWO_4$.	»
$Bi_2O_3 + PbO$.	(Belladen, 1922.)

BORIC ACID H_3BO_3.

Solubility in Aqueous Solutions of Hydrochloric Acid at 25°. (Kendall and Andrews, 1921.)

Normality of aq. HCl.	Gms. mols. H_3BO_3 per liter sat. sol.	Normality of aq. HCl.	Gms. mols. H_3BO_3 per liter sat. sol.	Normality of aq. HCl.	Gms. mols. H_3BO_3 per liter sat. sol.
0.0	0.8950	1.147	0.7042	5.160	0.3715
0.0660	0.8810	1.802	0.6270	7.073	0.3446
0.1302	0.8580	2.617	0.5431	9.389	0.3501
0.2733	0.8380	3.126	0.4976	11.56	0.3687
0.6112	0.7761	4.336	0.4189		

Solubility of Boric Acid in Aqueous Solutions of Nitric Acid at 25°.

(Kendall and Andrews, 1921.)

Normality of aq. HNO_3.	Gm. mols. H_3BO_3 per liter sat. sol.	Normality of aq. HNO_3.	Gm. mols. H_3BO_3 per liter sat. sol.	Normality of aq. HNO_3.	Gm. mols. H_3BO_3 per liter sat. sol.
0.0779	0.8820	1.580	0.6685	4.698	0.4471
0.1951	0.8610	2.372	0.5943	8.410	0.2963
0.5337	0.8028	3.118	0.5444	10 95	0.2305
0.9890	0.7361	3.806	0.4977	15.18	0.1973

Equilibrium in the System Boric Acid, Chromium Trioxide and Water.

(Gilbert, 1925.)

Results at 25°.			Results at 45°.		
	Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.	
$d_{\frac{25}{4}}$ of sat. sol.	CrO_3.	B_2O_3.	$d_{\frac{45}{4}}$ of sat. sol.	CrO_3.	B_2O_3.
1.052	4.90	2.79	1.038	2.40	4.76
1.086	9.42	2.28	1.219	25.60	2.33
1.156	18.07	1.58	1.528	53.80	1.85
1.212	24.31	1.35	1.603	57.34	1.12
1.296	33.05	1.02	1.603	57.50	0.87
1.420	43.75	0.65	1.612	58.10	0.92
1.699	59.90	0.16	1.674	61.56	0.90
1.699	62.40	0.10			

Solubility of Boric Acid in Aqueous Solutions of Various Salts at 18°.

(Kolthoff, 1926.)

Composition of aqueous solvent.	Gm. mols. H_3BO_3 per liter.	Composition of aqueous solvent.	Gm. mols. H_3BO_3 per liter.
– Water	0.736	1.0 Molar Na acetate	1.09
1.3 Molar Li Cl	0.56	0.5 » Na benzoate	0.96
0.5 » H Cl	0.655	0.05 » K Na tartrate	0.835
1.0 » »	0.595	0.25 » »	1.23
1.0 » Na Cl	0.724	0.50 » »	1.69
1.0 » K Cl	0.790	0.25 » Na oxalate	0.92
0.5 » $CaCl_2$	0.628	0.1 » Na lactate	0.84
1.0 » KNO_3	0.817	0.5 » »	1.31
1.0 » K S CN	0.778	1.0 » »	1.92
1.0 » K Br	0.768	0.1 » Na citrate	0.93
1.0 » K I	0.745	0.25 » »	1.17
0.5 » Na_2SO_4	0.880	0.50 » »	1.52
0.33 » K ferricyanide	0.760	0.20 » Na salicylate	0 985
0.25 » K ferrocyanide	0.850	0.50 » »	1.350

Solubility of Boric Acid in Aqueous Solutions of Various Salts at 22°.

(Dhar, 1926.)

An excess of boric acid was shaken with the aqueous salt solutions. The flasks stood in a thermostat at 22°. It is not clear whether constant or intermittent shaking was employed. The results are given in terms of excess of boric acid dissolved in the salt solution, but the figure for the amount dissolved in water alone is not given.

Used salt solution.	Gm. equiv. of salt per liter.	Excess H_3BO_3 dissolved, expressed in gm. equiv. per liter.	Dissociation constant.
Sodium benzoate C_6H_5COONa	0.0283	0.0020	0.3×10^{-5}
» »	0.0565	0.0032	0.3×10^{-5}
» »	0.1130	0.0052	0.2×10^{-5}
Sodium salicylate $C_6H_4.OH.COONa$ (*o*)	0.0544	0.0005	1.1×10^{-4}
» »	0.1087	0.0007	1.0×10^{-4}
» »	0.2173	0.0013	0.6×10^{-4}
Sodium acetate CH_3COONa	0.0475	0.0025	0.4×10^{-5}
» »	0.0950	0 0035	0.4×10^{-5}
» »	0.1900	0.0015	0.6×10^{-6}
Sodium butyrate C_3H_7COONa	0.0375	0.0018	0.4×10^{-5}
» »	0.0750	0.0040	0.3×10^{-5}
» »	0.1500	0.0102	0.7×10^{-6}

Solubility of Boric Acid in Aqueous Solutions of Salts at Several Temperatures. (Linderstrom-Lang, 1924.)

Composition of aq. solvent.		Gm. mols. H_3BO_3 dissolved per liter at		
Salt used.	Gm. equiv. per liter.	12°.	17°.85.	23°.85.
None..	$=H_2O$	0.6061	0.7219	0.8633
LiCl...	0.669	0.5276	0.6379	0.7622
» ...	1.338	0.4663	0.5642	0.6714
» ...	2.676	0.3683	0.4492	0.5396
» ...	4.113	0.2927	0.3126	0.4380
NaCl..	0 4	0.6033	–	0.8514
» ..	0.8	0.6000	0.7116	0.8426
» ..	1.6	0.5953	0.7008	0.8223
» ..	2.4	–	0.6889	–
» ..	3.2	0.5794	0.6769	0.7944
KCl...	0.7	0.6403	0.7558	0.8960
» ...	1.4	0.6714	0.7884	0.9306
» ...	2.1	0.7028	0.8199	0.9609
» ...	2.8	0.7379	0.8538	0.9959
HCl ..	0.6	–	0.6435	–
» ...	1.2	–	0.5778	–
» ...	1.5	–	0.5463	–
$BaCl_2$..	0.8		0.6769	
» ..	1.2	–	0.6594	–
» ..	1.6	–	0.6451	–

Composition of aq. solvent.		Gms. mols. H_3BO_3 dissolved per liter at 17°.85.
Salt used.	Gm. equiv. per liter.	
KI	0.6	0.7219
»	1.2	0.7239
»	1.8	0.7223
»	2.4	0.7175
$MgCl_2$.	0.495	0.6562
» .	0.989	0.5973
» .	1.979	0.4997
» .	3.958	0.3500
$CaCl_2$..	0.598	0.6530
» ..	1.195	0.5937
» ..	2.390	0.4890
» ..	4.780	0.3417
RbCl..	0.0	0.7313 (at 18°)
» ..	0.6	0.7689 »
» ..	1.2	0.8083 »
» ..	2.4	0.8880 »
CsCl..	0.732	0.7725 »
» ..	1.455	0.8203 »
» ..	2.177	0.8713 »

100 gms. Glycerol of $d = 1.2326$ (= 86.5 %) dissolve 13.78 gms. H_3BO_3 at 20°.
» » $d = 1.2645$ (= 98.5 %) » 24.8 » » »
(Holm, 1921, 1921*a*, 1922.)

Equilibrium in the System Boric Acid, Mannitol and Water at 25°. (Hermans, 1925.)

Gms. per 100 gms. sat. sol.		Solid Phase.
HBO_2.	Mannitol.	
4.25	5.43	H_3BO_3
4.68	11.5	»
5.07	17.2	»
5.28	20.0	»
5.52	22.5	»
5.70	25.1	» + Mannitol
5.68	24.4	Mannitol
5.40	25.4	»
5.13	24.7	»
2.27	20.8	»
0.0	17.7	»

Equilibrium in the System Boric Acid, Cis-Tetrahydronaphthalene 1.2 Diol. and Water at 25°. (Hermans, 1925.)

Gms. per 100 gms. sat. sol.		Solid Phase.
HBO_2.	Diol.	
3.94	1.85	Boric acid
3.92	2.08	»
3.90	2.14	» + Diol
3.29	2.10	Diol
1.55	1.99	»

Fusion point data for mixtures of boric oxide and sodium borate are given by Ponomarev, 1917. Results for mixtures of boric anhydride (B_2O_3) and cadmium oxide, lithium oxide, lead oxide and manganese oxide are given by Mazzetti and De Carli, 1926.

BORON TRIFLUORIDE BF_3.

The freezing-point curve of the system boron trifluoride-hydrogen sulfide was found by Germann and Booth, 1926, to contain two eutectics, a maximum corresponding to $BF_3.H_2S$ with f. pt. — 137° and a transition point of a compound $BF_3.7\ H_2S$ at — 99°. « Judging from the flatness of the curve at the maximum, the compound $BF_3.H_2S$ is considerably dissociated, so that there should be little difficulty separating H_2S as an impurity from BF_3 by fractional distillation ».

BORNEOL $C_{10}H_{17}OH$.

Solubility of Borneol in Water.

Using a stalogmometric method involving a comparison of the number of drops per unit of time in the case of saturated solutions and their dilutions, in comparison with similar determinations upon a series of solutions of known content, Rhode, 1922, found that 1 liter of H_2O dissolves 0.64 gm. (= 4.2 millimols.) borneol at 15-20°.

By means of an optical method in which an interferometer of the type described by Jamin (*Ann. chim. phys.*, 52, 171, 1858) was used, Mitchell, 1926, found that 1 liter of H_2O dissolves 0.693 gm. borneol at 15° and 0.740 gm. at 25°.

100 gms. abs. alcohol dissolve 175.5 gms. borneol at 20-25°. (Pucher and Dehn, 1921.)

Freezing-point lowering data for mixtures of *d* borneol and *l* borneol, *d* borneol and *d* camphor, *d* bornyl hydrogen phthalate and *l* bornyl hydrogen phthlate are given by Ross and Somerville, 1926.

BORNYL AMINE $C_{10}H_{17}NH_2$.

Distribution of Bornyl Amine Between Water and Xylene at 25°.

(Smith, 1921-1922.)

Millimols. $C_{10}H_{17}NH_2$ per liter of		
H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.0455	2.50	55.0
0.0570	3.16	55.5
0.08125	4.72	58.0

BROMAL HYDRATE $CBr_3CH(OH)_2$.

Equilibrium in the System Bromal-Water. (Efremov, 1918.)

The sealed tube method was used. The tubes were constantly shaken and the rate of change of temperature during the observation of the disappearance of the last crystal was not more than 0°.1 to 0°.2 per hour. The temperature of the separation of the liquid into two layers was very sharp and the interval between separation and unification was only 0.2°.

The original results were plotted and the following values read from the curves.

t° of Crystallization or melting.	t° of separation into 2 layers.	Gms. CBr_3COH per 100 gms. sat. sol.	Solid Phase.	t° of Crystallization or melting.	t° of separation into 2 layers.	Gms. CBr_3COH per 100 gms. sat. sol.	Solid Phase.
— 1.0	—	2.5	Ice	40.0	107.2	76.0	$CBr_3CH(OH)_2$
— 1.5	—	5.0	»	45.0	107.0	85.0	»
— 2.0	—	7.0	»	47.0	106.8	88.2	»
— 2.6 (Eutec.)	—	11.3	» + $CBr_3CH(OH)_2$	48.0	106.5	90.0	»
— 1.5	—	12.5	$CBr_3CH(OH)_2$	49.0	106.0	92.0	»
0.0	—	14.5	»	49.7	107.4	94.0	»
+ 5.0	—	21.5	»	49.0	106.9	94.5	»
10.0	—	29.5	»	47.0	103.5	95.9	»
20.0	—	44.5	»	45.0	99.0	96.5	»
25.0	110.2	52.0	»	40.0	85.0	98.0	»
30.0	109.6	60.0	»	30.0	69.0	98.7	»
35.0	108.2	67.5	»	20.0	57.0	99.2	»

The author also gives data for the density and viscosity of mixtures of bromal and water at different temperatures.

BROMINE Br.

100 gms. H_2O dissolve 4.14 gms. Br at 0° (Jones and Hartmann, 1916.)
» » 3.59 » 20.5° (Oliveri-Mandala, 1920.)
» » 3.51 » 25.0° (Pearce and O'Leary, 1923.)

The density of a saturated solution of bromine in water at 0° is $d_4^0 = 1.0286$, and it has the composition Br_2, 0.2539 mols. per liter; H^+, 0.001085; Br, 0.000126; Br_3, 0.000628; Br_5, 0.000331. (Jones and Hartmann, 1916.)

Solubility of Bromine in Aqueous Solutions of Hydrochloric Acid, Hydrobromic Acid and Sodium Chloride. (Oliveri-Mandala, 1920.)

In Aq. NaCl at 20°.6.		In Aq. HCl at 20°.8.		In Aq. HBr at 20°.8.	
Gm. mols. per liter		Gm. mols. per liter		Gm. mols. per liter	
NaCl.	Br.	HCl.	Br.	HBr.	Br.
0.7010	0.3211	1.070	0.4959	0.052	0.2744
1.0891	0.3861	1.605	0.6532	0.104	0.3331
1.3867	0.4246	2.140	0.8159	0.208	0.4538
1.7680	0.4925	2.463	0.928	0.416	0.6809
2.0260	0.5408	3.106	1.164	0.832	1.1735
2.313	0.6122			1.664	2.1293

Solubility of Bromine in Aqueous Solutions of Strontium Bromide at 25°. (Pearce and O'Leary, 1923.)

Mols. per 1000 gms. H_2O		Mols. per 1000 gms. H_2O		Mols. per 1000 gms. H_2O	
$SrBr_2$.	Br_2.	$SrBr_2$.	Br_2.	$SrBr_2$.	Br_2.
0.000	0.21966	0.06183	0.34871	0.25015	0.87806
0.01229	0.23862	0.12361	0.47838	0.30555	1.09510
0.02455	0.26533	0.19916	0.73592	0.39113	1.25960
0.05683	0.31524	0.22293	0.80442		

Distribution of Bromine at 25° Between : (Pearce and O'Leary, 1923.)

Water and Carbon tetrachloride.			Aq. $SrBr_2$ solutions and Carbon tetrachloride.			
Gm. mols. Br_2 per 1000 gms.				Gm. mols. Br_2 per 1000 gms.		
H_2O of the H_2O layer (W).	CCl_4 of the CCl_4 layer (C).	$\frac{C}{W}$.	Gm. mols. $SrBr_2$ per 1000 gms. H_2O.	CCl_4.	H_2O. Total Br_2.	H_2O. Free Br_2.
0.01529	0.28224	18.46	0.05386	Not given	0.05401	0.02262
0.02984	0.58550	19.62	0.15161	»	0.16689	0.03886
0.03561	0.76320	21.43	0.15615	»	0.11407	0.02328
0.04163	0.89829	21.58	0.29435	»	0.21511	0.02451
0.04613	1.0152	22.01	0.29851	»	0.29596	0.03828
0.04889	1.0686	22.88	0.34560	»	0.29380	0.03268
0.06600	1.6553	25.08	0.36740	»	0.23785	0.02447
0.06805	1.7714	26.03	0.39582	»	0.18796	0.01528
0.08648	2.3842	27.57	0.43315	»	0.32753	0.02689
0.08475	2.4207	28.56	0.59546	»	0.56390	0.04287
0.08779	2.5854	29.45	0.72234	»	0.46989	0.02629
0.09249	2.7498	29.73				

Distribution of Bromine Between Water and Carbon Tetrachloride at 0°. (Jones and Hartmann, 1916.)

Gm. Br_2 per gm. CCl_4 solution.	Density CCl_4-Br_2.	Mols. Br_2 per liter in CCl_4.	Mols. Br_2 per liter in H_2O.	Gm. Br_2 per gm. CCl_4 solution.	Density CCl_4-Br_2.	Mols. Br_2 per liter in CCl_4.	Mols. Br_2 per liter in H_2O.
0.1646	1.7667	1.8194	0.07015	0.06126	1.6809	0.6442	0.02870
0.08661	1.7012	0.9218	0.03937	0.05433	1.6755	0.5695	0.02572
0.08162	1.6972	0.8666	0.03771	0.01847	1.6470	0.1903	0.00901
0.07261	1.6896	0.7676	0.03344	0.01640	1.6454	0.1687	0.008007

Data are also given for the distribution of bromine between aqueous KBr solutions and carbon tetrachloride at 0°.

DISTRIBUTION OF BROMINE BETWEEN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AND CARBON TETRACHLORIDE AT 30°. (Ray and Sarkar, 1922.)

Normality of the aq. HCl.	Concentration of Bromine in Aq. layer.	Concentration of Bromine in CCl_4 layer.	Normality of the aq. HCl.	Concentration of Bromine in Aq. layer.	Concentration of Bromine in CCl_4 layer.
0.25.....	1.584	36.36	1.0.....	1.291	16.92
0.25.....	2.246	51.87	1.0.....	1.541	19.46
0.5.....	0.6852	12.69	1.0.....	1.881	24.00
0.5.....	0.9210	16.48	1.0.....	2.989	38.38
0.5.....	2.1520	38.54			

Freezing-point lowering data are given for the following systems :

Bromine + Iodine (Kruyt and Heldermann, 1918.)
» + Ethylene oxide (Maass and Boomer, 1922.)
» + Carbon tetrabromide (Biltz and Meinecke, 1923.)
» + Nitric oxide (Trautz and Dalai, 1920.)
» + Tellurium (Damiens, 1921 *a*; 1923.)

BROMOFORM $CHBr_3$.

100 gms. anhydrous formic acid dissolve 25.3 gms $CHBr_3$ at 25°. (Gordon and Reid, 1922.)
Freezing-point lowering data for mixtures of bromoform and nitrogen peroxide are given by Pascal, 1923.

BRUCINE $C_{21}H_{20}(OCH_3)_2N_2O_2.4H_2O$.

Kolthoff, 1925, reports that the solubility of brucine in water, as determined by Mauz (Dissertation, Stuttgart, 1904), using the $.4H_2O$ compound is $1.33.10^{-3}$ gm. mol. per liter. From this value and the first dissociation constant ($K_1 = 9.2.10^{-7}$) he calculates the solubility product of brucine to be

$$L_{Brucine} = 9.2.10^{-7} \times 1.33.10^{-3} = 1.22.10^{-9}.$$

SOLUBILITY OF BRUCINE IN MIXTURES OF ALCOHOL AND QUINOLINE AT 20-25°. (Pucher and Dehn, 1921.)

Per cent C_7H_9N. in solvent.	Gms. Brucine per 100 gms. solvent.	Per cent C_7H_9N in solvent.	Gms. Brucine per 100 gms. solvent.	Per cent C_7H_9N in solvent.	Gms. Brucine per 100 gms. solvent.
0.0.....	3.5 (2.35)	47.5.....	34.6	80.0.....	75.00
10.0.....	3.86	50.0.....	36.5	90.0.....	78.7
23.2.....	10.87	60.0.....	44.6	100.0.....	79.0
37.5.....	15.09	70.0.....	68.20		

100 gms. equi. mol. mixture of alcohol and quinoline dissolve 43.51 gms. brucine at 20-25°. (Pucher and Dehn, 1921.)

BRUCINE HELIANTHATE $C_{23}H_{26}N_2O_4.C_{14}H_{15}N_3SO_3.H_2O$.

100 gms. H_2O dissolve 0.245 gms. $C_{23}H_{26}N_2O_4.C_{14}H_{15}N_3SO_3H_2O$ at 20-25°. (Stark and Dehn, 1918.)

BUTYLENE, pseudo and iso, C_4H_8.

1.0 cc. abs. C_2H_5OH dissolves 49.7 to 52.9 cc. pseudo C_4H_8 at 19° and 760 mm. pressure
1.0 cc. » » » 44.6 to 45.1 cc. iso » » » »
(Spörry, 1922, 1926.)

BUTYL ACETATE (*iso*) $C_2H_3O_2.C_4H_9$.

100 gms. sat. solution of iso butyl acetate in water at 20° contain 0.67 gm. $C_2H_3O_2.C_4H_9$. (Führner, 1924.)

BUTYL ALCOHOL *normal* $CH_3.(CH_2)_2CH_2OH$.

SOLUBILITY IN WATER, DETERMINED BY THE SYNTHETIC METHOD. (Führner, 1924.)

t°.	Gms. $CH_3(CH_2)_2CH_2OH$ per 100 gms. sat. sol.	t°.	Gms. $CH_3(CH_2)_2CH_2OH$ per 100 gms. sat. sol.	t°.	Gms. $CH_3(CH_2)_2CH_2OH$ per 100 gms. sat. sol.
0.....	10.45	40.....	6.55	80.....	7.00
10.....	9.00	50.....	6.35	90.....	7.80
20.....	7.90	60.....	6.35	100.....	9.05
30.....	7.10	70.....	6.55	110.....	10.90

The original results were plotted and the above table constructed from the curve.

Mutual Solubility of Normal Butyl Alcohol and Water.

(Hill and Malisoff, 1926.)

Highly purified butyl alcohol was employed. The determinations were made in the two-bulbed solubility flasks previously described.

(*J. Am. Chem. Soc.*, **45**, 1143, 1923.)

	Butyl Alcohol Phase.			Water Phase.	
t°.	Gms. $CH_3(CH_2)_2CH_2OH$ per 100 gms. sat. sol.	Density of sat. sol.		Gms. $CH_3(CH_2)_2CH_2OH$ per 100 gms. sat. sol.	Density of sat. sol.
5.....	80.38	0.8598		9.55	0.9883
10.....	80.33	0.8567		8.91	0.9877
15.....	80.14	0.8533		8.21	0.9881
20.....	79.93	0.8484		7.81	0 9873
25.....	79.73	0.8450		7.35	0.9865
30.....	79.38	0.8424		7.08	0.9851
35.....	78.94	0.8397		6.83	0.9835
40.....	78.59	0.8345		6.60	0.9841
50.....	77.58	0.8307		6.46	0.9799
60.....	76.38	0.8253		6.52	0.9766
70.....	74.79	0.8200		6.73	0.9721
80.....	73.53	0.8159	t°.	6.89	0.9675
92.....	69.24	–	97.9.....	8.74	–
106.1.....	63.88	–	114.5.....	12.73	–
122.3.....	49.85	–	116.9.....	13.46	–
124.3.....	42.02	–	123.3.....	19.73	–
125.15.....	32.82	–	124.83.....	27.26	–
			125.10.....	32.82	–
			125.15.....	30.44	–

The quadruple point is at $-2°.95$. The consolute solution contains 32.5 gms. $CH_3(CH_2)_2CH_2OH$ per 100 gms. sat. solution at the critical solution temperature 125°.15. These values as given by Drouillon, 1925, are respectively 28.0 gms. and 129°.5. As given by Brun (1925) they are respectively 34.0 gms. and 129°.

Equilibrium in the System Normal Butyl Alcohol, Ethyl Alcohol and Water. (Drouillon, 1925.)

The synthetic method was used. Known mixtures were heated in sealed tubes to complete solution of the three constituents and then cooled slowly, while being shaken, untill clouding appeared. A series of aqueous-ethyl alcohol mixtures were prepared and to each of these, increasing amounts of normal butyl alcohol were added and the temperatures of complete solution determined. The results were plotted and the following values for the isothermal curves were obtained.

Gms. $CH_3(CH_2)_2CH_2OH$ per 100 gms. sat. sol. at

Gms. C_2H_5OH per 100 gms. $H_2O+C_2H_5OH$ mixture.	20°.		40°.		60°.		80°.		100°.		120°.	
	Butyl alcohol Phase.	Water Phase.	Butyl alcohol Phase.	Water Phase.	Butyl alcohol Phase.	Water Phase.	Butyl alcohol Phase.	Water Phase.	Butyl alcohol Phase.	Water Phase.	Butyl alcohol Phase.	Water Phase.
0.0 (= Water).	81.6	6.6	80.3	6.0	78.5	5.5	74.6	6.4	68.8	7.5	57 3	11.8
2.49.....	81.1	6.8	79 6	6.3	77.0	6.2	73.1	7.1	68.8	10 3	49.2	26.5
5.02.....	–	7.1	–	6.7	75.9	7.3	72.0	8.6	64.2	16.2		
7.51.....	–	7.4	–	7.7	74.0	8 5	69.7	12.8	59.4	28.9		
10.09.....	78.2	8.2	76.4	8.9	73.3	12.4	67.5	21.0	-	47.0		
12.06.....	–	10.7	–	11.6	71.5	17.5	64.8	28.5				
15.39.....	-	15.8	72.7	20.5	68.0	28.5	57.8	41.5				
17.54.....	74.7	19.4	71.0	24.4	66.1	33.6						
20.0.....	73.3	24.0	68.9	31.3	62.3	40.5						
22.5.....	69.7	32.3	64.5	40.1								
24.99.....	65.7	40.4										

The author also gives data from which the composition of a series of conjugated layers at 20° can be estimated.

BUTYL ALCOHOL *iso* $(CH_3)_2CH.CH_2OH$.

MUTUAL SOLUBILITY OF ISO BUTYL ALCOHOL AND WATER. (Michels, 1922.)

Commercial iso butyl alcohol was fractionated into 10 portions and only those which distilled at a constant temperature were used for the solubility determinations. The density was 0.8197. The determinations were made by the sealed tube method. The numerous determinations of the author were plotted and the following values obtained from the curve.

	Gms. $(CH_3)_2CH.CH_2OH$ per 100 gms.			Gms. $(CH_3)_2CH.CH_2OH$ per 100 gms.	
t°.	H_2O rich layer.	Iso Butyl Alcohol rich layer.	t°.	H_2O rich layer.	Iso Butyl Alcohol rich layer.
—10.....	13.4	86.2	90.....	8.1	73.2
0.....	11.5	85.4	100.....	9.3	70.2
+10.....	9.8	84.4	110.....	11.2	66.7
20.....	8.5	83.6	120.....	14.0	61.5
30.....	7.5	82.7	125.....	16.5	57.5
40.....	7.0	81.6	130.....	21.0	51.5
50.....	6.6	80.4	131.....	23.0	49.0
60.....	6.4	79.0	132.....	26.0	45.0
70.....	6.6	77.2	132.8 (crit. t.).....	37.0	
80.....	7.2	75.2			

A small scale diagram, without numerical data, is given for the above system by Brun, 1925. The critical solution temperature is stated to be 123.5° and the corresponding concentration, 37.5 gms. iso butyl alcohol per 100 gms. sat. solution. This author also gives two diagrams and several determinations of tie lines for the system iso butyl alcohol, ethyl alcohol and water.

BUTYL ALCOHOL (Secondary) $CH_3.CHOH.CH_2CH_3$.

THE MUTUAL SOLUBILITY OF SECONDARY BUTYL ALCOHOL AND WATER AT HIGH PRESSURES. (Timmermans, 1922.)

The following data for the critical temperature of solution at high pressures are given.

The constants of the secondary butyl alcohol were : b. pt. $= 99.5°$, $d_{\frac{0}{4}} = 0.82263$.

Pressure in kilograms.	Critical temp. of solution.	Pressure in kilograms.	Critical temp. of solution.
1	The triphase system crystallizes at −8°.45	800	58.6
100	+5.3	830	Homogeneous at all temps.
200	17.8	800	73.5
300	24.8	700	81.3
400	30.8	600	85.3
500	36.7	120	105.3
600	42.7	1	113.8
700	49.6		

BUTYL AMINE (Normal) $CH_3(CH_2)_2CH_2NH_2$.

DISTRIBUTION OF NORMAL BUTYL AMINE AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Ethyl Ether.			Water and Xylene.		
Millimols. $CH_3(CH_2)_2CH_2NH_2$ per liter of			Millimols. $CH_3(CH_2)_2CH_2NH_2$ per liter of		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.85	0.76	0.895	0.671	0.328	0.490
1.35	1.23	0.912	1.28	0.718	0.560
2.15	2.20	1.02	2.40	1.50	0.665
3.20	3.52	1.10	5.60	4.40	0.785

DISTRIBUTION AT 25° OF : (Smith, 1921-1922.)

Iso Butyl amine $(CH_3)_2CH.CH_2NH_2$, Between Water and Xylene.

Millimols. $(CH_3)_2CH.CH_2NH_2$ per liter of		
H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.625	0.362	0.58
1.775	0.975	0.55
3.575	2.075	0.58

Di *iso* Butyl Amine Acid Phthalate*. Between Acetone and Glycerol.

Millimols. Acid Phthalate per liter of		
Glycerol layer (G).	Acetone layer (A).	$\frac{A}{G}$.
1.90	1.10	0.580
3.95	2.10	0.530
5.85	3.10	0.530
7.60	3.80	0.500
9.65	4.45	0.462

* See Note p. 1301.

BUTYL BROMIDE, CHLORIDE, IODIDE etc.

APPROXIMATE SOLUBILITY OF EACH IN WATER.
(Fühner, 1924.)

Componnd.	Formula.		t°.	Gms. cmpd. per 100 gms. sat. sol.
Butyl bromide.....	$CH_3(CH_2)_2CH_2Br$	(1.23)	16	0.058
Iso Butyl bromide.....	$(CH_3)_2CH.CH_2Br$	(1.21)	18	0.051
Butyl chloride.....	$CH_3(CH_2)_2CH_2Cl$	(0.86)	12.5	0.066
Iso Butyl chloride.....	$(CH_3)_2CH.CH_2Cl$	(0.86)	12.5	0.92
Butyl iodide.....	$CH_3(CH_2)_2CH_2I$	(1.54)	17.5	0.021
Iso Butyl urethan.....	$(CH_3)_2CH.CH_2NHCO_2.C_2H_5$		15.5	2.00

The figures in parentheses are the approximate specific gravities of the compounds.

Mono BUTYL GLYCOL ETHERS, normal and iso $C_6H_{14}O_2$.

MUTUAL SOLUBILITY OF NORMAL AND OF ISO BUTYL GLYCOL ETHER IN WATER.
(Cox and Cretcher, 1926.)

These systems give curves which are complete circles, consequently for each concentration of glycol ether there is an upper solution temperature and a lower solution temperature.

Results for *n* Butyl Ether.
(b. pt. = 170°.6; $d_{\frac{25}{15}} = 0.9011$)

Wt. % *n* Butyl Ether.	Lower solution temp.	Upper solution temp.
9.18.....	75.0	86.0
9.94.....	65.8	97.0
11.45.....	57.6	109.3
14.95.....	51.6	120.4
19.94.....	49.6	126.8
24.78.....	49.1	128.0
30.03.....	49.6	127.7
34.42.....	50.1	126.8
39.67.....	51.3	125.3
44.95.....	53.5	122.9
50.08.....	58.0	117.8
55.08.....	67.1	107.7
57.87.....	80.0	94.0

Results for *iso* Butyl Ether.
(b. pt. = 158°.8; $d_{\frac{25}{15}} = 0.8950$)

Wt. % of Iso Butyl Ether.	Lower solution temp.	Upper solution temp.
7.57.....	54.5	101.5
9.97.....	36.6	126.1
16.68.....	25.9	145.0
24.51.....	24.6	150.0
31.54.....	24.7	150.2
39.70.....	25.5	149.3
47.46.....	27.1	147.9
55.80.....	31.9	142.6
61.80.....	38.9	132.9
66.13.....	47.6	120.6
67.70.....	51.0	114.5
70.86.....	just on curve	

BUTYL OXAMATE *iso* $CONH_2COO.(CH_3)_2CHCH_2$.

Freezing-point lowering data for binary and ternary mixtures of iso butyl, methyl and ethyl oxaminic acid Esters are given by Praetorius, 1924.

BUTYRIC ACID (Normal) $CH_3(CH_2)_2COOH$.

Distribution of Butyric Acid at 25° Between Water and Benzene.
(Brown and Bury, 1923.)

Normality of $CH_3(CH_2)_2COOH$ in		Normality of $CH_3(CH_2)_2COOH$ in		Normality of $CH_3(CH_2)_2COOH$ in	
H_2O layer.	C_6H_6 layer.	H_2O layer.	C_6H_6 layer.	H_2O layer.	C_6H_6 layer.
0.0421	0.0234	0.1617	0.257	0.423	1.116
0.0635	0.0525	0.1844	0.320	0.702	2.344
0.1045	0.1213	0.245	0.522	0.938	2.819
0.1363	0.1941	0.281	0.657	1.369	4.015

Distribution of Normal Butyric Acid Between :

Water and Chloroform at 25°. (Smith, 1921-1922.)

Millimols. $CH_3(CH_2)_2COOH$ per liter of		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
1.040	0.488	0.470
1.169	0.574	0.491
1.402	0.710	0.506
1.680	0.866	0.516
2.290	1.252	0.546
3 930	2.190	0.557

Water and Ethyl Ether at 25°. (Smith, 1921-1922.)

Millimols. $CH_3(CH_2)_2COOH$ per liter in		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.335	1.40	4.18
0.59	2.65	4.50
1.60	5.02	4.73
1.80	9.20	5.12
2.64	14.04	5.32

Water and Ethyl Ether at 21°. (Behrens, 1926.)

Concentration in		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.01214	0.0744	6.13
0.0181	0.1136	6 28
0.0228	0.1469(12°)	6.44
0.0264	0.1707	6.46
0.0407	0.2763	6.79

Distribution of Normal Butyric Acid at 25° Between : (Smith, 1921-1922.)

Water and Xylene.

Millimols. $CH_3(CH_2)_2COOH$ per liter of		
H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
4.500	0.700	0.156
6.475	1.025	0.158
8.20	1.30	0.159

Acetone and Glycerol.

Millimols. $CH_3(CH_2)_2COOH$ per liter of		
Glycerol layer (G).	Acetone layer (A).	$\frac{A}{G}$.
0.275	3.45	12.5
0.50	6.4375	12.8
1.15	14.60	12.7
2.10	26 65	18.7

Distribution of Butyric Acid at 25° Between Water and Cotton Seed Oil.
(Gordon and Reid, 1922.)

Gms. Butyric Acid per 100 gms.		Gms. Butyric Acid per 100 gms.	
H_2O layer.	Oil layer.	H_2O layer.	Oil layer.
2.7	1.11	14.0	10.45
5.0	2.85	30.5	20.8
9.2	6.96	41.3	22.8

Freezing-point lowering data for mixtures of butyric acid and *o* phenylene diamine are given by Kremann, Weber and Zechner, 1925.

BUTYRIC ACID (*iso*) $(CH_3)_2CH.COOH$.

The Mutual Solubility of Iso Butyric Acid and Water at High Pressures.
(Timmermans, 1922.)

The following determinations of the critical temperature of solution at high pressures are given.

The constants of the iso butyric acid were, b. pt. = 154°.35, f. pt. —4°.7, $d_4^0 = 0.96819$.

Pressure in kilograms.	Critical temp. of solution.	Pressure in kilograms.	Critical temp. of solution.
1	26.4	300	9.40
50	23 76	475	0.0
100	21.14	525 (ord. pressure)	—2.6
170	17.34		—3.0 (cryst. pt. of triphase system)

DISTRIBUTION OF ISO BUTYRIC ACID AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Benzene.

Millimols. $(CH_3)_2CHCOOH$ per liter of		
H_2O layer (C_1).	C_6H_6 layer (C_2).	$\frac{C_2}{C_1}$.
2.55	0.410	0.170
3.75	0.7125	0.190
9.60	2.20	0.230
18.90	5.0	0.264

Water and Carbon Tetrachloride.

Millimols. $(CH_3)_2CHCOOH$ per liter of		
H_2O layer (C_1).	CCl_4 layer (C_2).	$\frac{C_2}{C_1}$.
4.775	0.305	0.0639
7.10	0.595	0.0838
9.25	1.05	0.1135
13.80	1.725	0.125
17.50	2.70	0.154

Water and Chloroform.

Millimols. $(CH_3)_2CHCOOH$ per liter of		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
1.025	0.350	0.342
2.100	0.750	0.357
3.190	1.275	0.400
5.450	2.350	0.431

NOTE. — In the series of papers by Smith, 1921-1922, the results for the distribution of butyric acids are given under « *n* butyric acid » and « *sec.* butyric acid. » In the absence of any description or constants of either of the compounds it is assumed that *Iso* butyric acid was employed in all cases referred to under « *sec.* butyric acid ».

DISTRIBUTION OF ISO BUTYRIC ACID AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Ethyl Ether.

Millimols. $(CH_3)_2CHCOOH$ per liter of		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.29375	0.85625	2.92
0.500	1.6125	3.22
0.975	3.225	3.30
1.625	5.575	3.43
2.6	8.4	3.23

Acetone and Glycerol.

Millimols. $(CH_3)_2CHCOOH$ per liter of		
Glycerol layer (G).	Acetone layer (A).	$\frac{A}{G}$.
0.350	3.40	9.72
0.375	3.375	9.00
0.625	6.825	9.90
0.65	6.80	10.45
1.30	11.85	9.14
2.20	20.20	9.20

DISTRIBUTION OF ISO BUTYRIC ACID AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Toluene.

Millimols. $(CH_3)_2CHCOOH$ per liter of		
H_2O layer (C_1).	$C_6H_5CH_3$ layer (C_2).	$\frac{C_2}{C_1}$.
1.975	0.2025	0.1025
3.60	0.50	0.139
8.90	1.65	0.185
15.70	5.50	0.350

Water and Xylene.

Millimols. $(CH_3)_2CHCOOH$ per liter of		
H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
3.65	0.574	0.157
9.575	1.625	0.17
18.35	3.50	0.19

OxyBUTYRIC ACIDS α and β $CH_3.CH_2.CH(OH)COOH$.

DISTRIBUTION OF α AND OF β OXY BUTYRIC ACIDS AT 25° BETWEEN WATER AND ETHYL ETHER. (Smith, 1921-1922.)

Results for α Oxy Butyric Acid.

Millimols. α $CH_3.CH_2.CH(OH)COOH$ per liter of		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
1.7625	1.0875	0.617
2.875	1.875	0.652
4.1375	2.7125	0.656
5.75	3.55	0.617
9.70	6.40	0.660

Results for β Oxy Butyric Acid.

Millimols. β $CH_3.CH_2.CH(OH)COOH$ per liter of		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
1.075	0.375	0.349
1.725	0.600	0.348
3.05	1.075	0.352
4.75	1.70	0.358
6.60	2.36	0.356

γ Phospho *n* BUTYRIC ACID $HOOC.CH_2.CH.CH_2PO(OH)$.

100 gms. sat. solution of γ phospho *n* butyric acid in water contain 41.3 gms. $HO\,OC.CH_2.CH.CH_2.PO\,(OH)$ at 0° and 53.3 gms. at 20°. (Nylen, 1926.)

β BUTYRO Dipalmitin (β Butyryl αα'-dipalmityl glyceride) $C_{41}H_{74}O_6$.

100 gms. absolute ethyl alcohol dissolve 0.55 gm. of the cmpd at. 20°. (Whitby, 1926.

CADMIUM AMMONIATES of the type $[Cd(NH_3)_6]X_2$.

SOLUBILITY OF CADMIUM AMMONIATES AT 11° IN : (Ephraim and Mosimann, 1922.)

Aqueous ammonia of $d_{11} = 0.930$.	Per liter of sat. solution		Equal volumes of aq. ammonia of $d_{11} = 0.943$ and 96% alcohol.	Per liter of sat. solution	
Salt.	Gms. Cd.	G. mol. salt.	Salt.	Gms. Cd.	G. mol. salt.
Iodide.....	1.57	0.014	Iodide.....	0.71	0.0063
Perchlorate..	2.57	0.023	Perchlorate...	0.819	0.0073
Bromide.....	10.98	0.098	Bromide.....	2.94	0.026
Nitrate.....	35.36	0.316	Nitrate.....	15.75	0.140
Sulfate.....	73.48	0.656	Sulfate.....	1.04	0.009
Chloride.....	108.32	0.967	Chloride.....	23.83	0.213

In the case of the determinations in mixtures of ammonia and alcohol the solutions were prepared by adding an equal volume of 96 % alcohol to the sat. solutions of the salts in aq. ammonia of $d_{11} = 0.930$. The amount of salt which remanied in solution was determined.

CADMIUM BENZOATE etc.

SOLUBILITY OF EACH IN WATER AT 20°. (Ephraim and Pfister, 1925.)

Salt.	Formula.	Gms. anhydrous salt per 100 gms. sat. sol.
Cadmium Benzoate.....	$(C_6H_5COO)_2Cd.2H_2O$	3.340
» -4 Nitro Benzoate.....	$(C_7H_4O_4N)_2Cd\ 2H_2O$	0.445
» -4 Chloro Benzoate.....	$(C_7H_4O_2Cl)_2Cd.2H_2O$	0.779
» -4 Methoxy Benzoate...	$(C_8H_7O_3)_2Cd.H_2O$	0.402
» Cinnamate.....	$C_{18}H_4O_4Cd.2H_2O$	0.0374

CADMIUM BROMIDE $CdBr_2$.

Cryoscopic determinations upon aqueous solutions of mixtures of cadmium bromide and alkali bromides and of cadmium chloride and alkali chlorides are given by Cornec and Urbain, 1919.

Freezing-point lowering data for mixtures of $CdBr_2$ and $TlNO_3$ are given by Bergmann, 1926.

CADMIUM CHLORIDE $CdCl_2$.

SOLUBILITY OF CADMIUM CHLORIDE IN PYRIDINE. (Mason and Mathews, 1925.)

t°.	Gms. $CdCl_2$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $CdCl_2$ per 100 gms. sat. sol.	Solid Phase.
0.....	0.46	$CdCl_2.6C_5H_5N$	25.....	0.70	$CdCl_2.2C_5H_5N$
4.....	0.78	»	30.....	0.67	»
7.2.....	0.91	»	40.....	0.61	»
9.0 tr. pt.....	0.97	»+$CdCl_2.2C_5H_5N$	60.....	0.54	»
10.0.....	0 93	$CdCl_2.2C_5H_5N$	80.....	0.49	»
15.0.....	0.80	»	100.....	0.50	

100 gms. sat. sol. of $CdCl_2$ in selenium oxychloride ($SeOCl_2$) contain 0.15 gms. $CdCl_2$ at 25°. (Wise, 1923.)

Freezing-point lowering data for mixtures of $CdCl_2 + AgNO_3$ are given by Bergmann, 1922-1924, 1926.

CADMIUM FUMARATE $CdC_4H_2O_4$.

100 gms. H_2O dissolve 0.09 gms. $CdC_4H_2O_4$ at 30°. Weiss and Downes, 1923.)

CADMIUM HELIANTHATE $(C_{14}H_{14}N_3SO_3)_2Cd.4H_2O$

1000 cc. H_2O dissolve 0.07 gms. $C_{14}H_{14}N_3SO_3$ in the form of cadmium helianthate at 20-25°. (Stark and Dehn, 1918.)

CADMIUM Nitroso β Phenyl HYDROXYLAMINE.

100 gms. H_2O dissolve $3.3.10^{-4}$ gms. cadmium nitroso β phenyl hydroxylamine at 18°. (Martin.)

CADMIUM IODIDE CdI_2.

SOLUBILITY OF CADMIUM IODIDE IN WATER.

(Cohen, Hetterschij and Moesveld, 1920.)

t°.	Gms. CdI_2 per 100 gms. sat. sol.	t°.	Gms. CdI_2 per 100 gms. sat. sol.	t°.	Gms. CdI_2 per 100 gms. sat. sol.
0.0.....	44.083	25.0.....	46.295	35.0.....	47.296
15.0.....	45.363	27.5.....	46.540	37.5.....	47.573
20.0.....	45.829	30.0.....	46.793	40.0.....	47.833
22.5.....	46.053	32.5.....	47.039		

100 cc. of pyridine dissolve 0.43 gm. CdI_2 at 25°. (Müller, R., 1924.

Freezing-point lowering data are given for mixtures of :

CdI_2 + HgI_2 (Losana, 1926.)
» + » + PbI_2 » »
» + $AgNO_3$ (Bergmann, 1922–1924; 1926.)

CADMIUM MALEATE $CdC_4H_2O_4.2H_2O$.

100 gms. H_2O dissolve 0.66 gms. Cd $C_4H_2O_4$ at 30°. (Weiss and Downs, 1923.)

CADMIUM NITRATE $Cd(NO_3)_2$.

Freezing-point lowering data for mixtures of $Cd(NO_3)_2.4H_2O$ + $Ca(NO_3)_2.4H_2O$ at pressures from 1 to 3000 kg/cm. are given by Hasselblatt, 1921.

CADMIUM OXIDE CdO.

The solubility of cadmium oxide (or hydroxide) in water at 18° was found to be 0.038 millimols (5.0 milligrams) per liter as calculated from electrolytic conductivity, taking into consideration the carbonate content of the H_2O and assuming complete dissociation. The value obtained from the used amount of acid required for saturation, determined conducto-titrametrically, was 0.036 millimols (4.80 milligrams) per liter. (Remy, 1925.)

CADMIUM SULFATE $CdSO_4.\frac{8}{3}H_2O$.

SOLUBILITY OF CADMIUM SULFATE IN WATER.

(Cohen and Wolters, 1917, 1920; Steinwehr, 1920.)

t°.	Mols. H_2O required to dissolve 1 mol $CdSO_4$.	Gms. $CdSO_4$ per 100 gms. H_2O.	Solid Phase.	t°.	Mols. H_2O required to dissolve 1 mol $CdSO_4$.	Gms. $CdSO_4$ per 100 gms. H_2O.	Solid Phase.
—12...	15.326	75.51	$CdSO_4.\frac{8}{3}H_2O$	11.5...	15.243	75.93	$CdSO_4.\frac{8}{3}H_2O$
— 9...	15.338	75.46	»	13.....	15.223	76.02	»
— 6...	15.331	75.50	»	15.....	15.207	76.08	»
— 3...	15.315	75.46	»	16.....	15.195	76.17	»
0...	15.327	75.51	»	16.96..	15.179	76.25	»
+ 5...	15.301	75.63	»	18.....	15.167	76.30	»
7...	15.295	75.68	»	19.....	15.153	76.37	»
9...	15.261	75.84	»	25.....	15.070	76.79	»

CADMIUM Anthracene SULFONATE etc.

SOLUBILITY OF EACH IN WATER.

(Ephraim and Pfister, 1925; Ephraim and Seger, 1925.)

Compound.	Formula.	t°.	Gms. anhydrous cmpd. per 100 cc. sat. sol.
Cadmium anthracene-2-sulfonate.	$Cd(C_{14}H_9SO_3)_2.6H_2O$	20	0.00925
» benzene sulfonate.....	$Cd(C_6H_5SO_3)_2.7H_2O$	20	31.239
» » »	$Cd(C_6H_5SO_3)_2.6H_2O$	18	27.969
» » »	»	34	35.511
» » »	»	49.5	44.936
» » »	»	64.5	55.764
» » »	»	80.5	69.200

SOLUBILITY OF CADMIUM NAPHTHALENE SULFONATES IN WATER.
(Ephraim and Pfister, 1924; Ephraim and Seger, 1925.)

Compound.	Formula.	t°.	Gms. Anhydrous cmpd. per 100 gms. sat. sol.
Cadmium naphthalene-1-sulfonate.....	$Cd(C_{10}H_7SO_3)_2.6H_2O$	17	4.508
» » -2- »	»	16.5	0.872
» » -2- »	»	20.0	0.696
» » » »	»	32.0	1.033
» » » »	»	45.0	1.550
» » » »	»	54.5	2.085
» » » »	»	65	2.925
» » » »	»	69	3.407
» » » »	»	78	5.061
» » » »	»	82	5.799
Cadmium naphthalene-6-oxy-2-sulfonate...	$Cd(C_{10}H_7SO_3)_2.6\text{-}7H_2O$	20	1.651

CAESIUM ALUMS.

SOLUBILITY OF CAESIUM GALLIUM SELENATE ALUM AND OF CAESIUM GALLIUM SULFATE ALUM IN WATER AND OTHER SOLVENTS AT 25°.
(Dennis and Brigmann, 1918.)

Alum.	Formula.	Solvent.	Gms. Ga_2O_3 per 100 gms. sat. sol.	Gms. Alum per 100 cc. sat. sol.
Caesium gallium selenate alum..	$CsGa(SeO_4)_2.12H_2O$	Water	0.53	4.15
» » sulfate alum...	$CsGa(SO_4)_2.12H_2O$	»	0.23	1.51
» » » » ...	»	50% alcohol	0.00059	0.00387
» » » » ...	»	70% »	0.00054	0.00356
» » » » ...	»	Aq. mixture*	0.0035	0.0228

* Composed of 35 cc. H_2O, 50 cc. C_2H_5OH and 15 cc. conc. H_2SO_4.

Constant agitation is not mentioned. The analyses are reported in terms of gms. of Ga_2O_3 per 100 gms. of saturated solution and the corresponding gms. of alum are calculated to 100 cc. of sat. solution, but the density determinations required for this are not given.

CAESIUM ACETATE CH_3COOCs.

SOLUBILITY OF CAESIUM ACETATE IN WATER.
(Sidgwick and Gentle, 1922.)

t°.	Gms. CH_3COOCs per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. CH_3COOCs per 100 gms. sat. sol.	Solid Phase.
— 1.36.....	6.63	Ice	+ 21.5.....	91.06	CH_3COOC
— 5.32.....	19.38	»	61.1.....	91.98	»
— 7.92.....	25.26	»	88.6.....	93.09	»
—13.07.....	34.22	»	133.8.....	95.78	»
— 2.5.....	89.71	CH_3COOCs	194.0 m. pt.	100.00	»

CAESIUM BENZOATE C_6H_5COOCs.

SOLUBILITY OF CAESIUM BENZOATE IN WATER.
(Sidgwick and Ewbank, 1922.)

t°.	Gms. C_6H_5COOCs per 100 gms. sat. sol.	Solid Phase.
— 1.22.....	9.92	Ice
— 4.44.....	25.62	»
—10.81...	43.08	»
+12.0.....	74.75	C_6H_5COOCs
53.5.....	77.34	»
124.0.....	81.51	»

SOLUBILITY OF CAESIUM ORTHO, META AND PARA HYDROXY BENZOATES IN WATER. (Sidgwick and Ewbank, 1922.)

Results for Caesium Ortho Hydroxy Benzoate.			Results for Caesium Meta Hydroxy Benzoate.			Results for Caesium Para Hydroxy Benzoate.		
t°.	Gms. $C_6H_4.OH.COOCs$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $C_6H_4.OH.COOCs$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $C_6H_4.OH.COOCs$ per 100 gms. sat. sol.	Solid Phase.
—1.83.	16.08	Ice	— 1.97.	16.98	Ice	—1.56.	14.34	Ice
—4.24.	30.97	»	— 4.92.	32.84	»	—2.42.	20.38	»
—8.08.	47.71	»	— 9.65.	48.53	»	—4.27.	29.57	» *
—3.5..	65.70	*o* 1.1	—18.50.	63.15	»	+3.5..	29.57	*p* 1.1
+4.5..	68.24	»	+10.0..	77.10	*m* 1.*x*	27.5..	40.80	»
20.5..	70.59	»	19.0..	78.52	»	49.0..	50.01	»
33 0..	80.07	»	29.0..	81.70	»	75.5..	60.36	*p* 1.0
41.5..	83.35	*o* 1.$^1/_2$*	35.0..	84.45	»	90.3..	65.35	»
54.0..	85.67	»	40.0..	86 35	»	107.5..	70.67	»
67.5..	89.91	»	41.5..	87.88	*m* 1.0*	118.0..	73.84	»
84.3..	92.80	*o* 1.0	73.0..	89.88	»	136.0..	79.88	»
107.5..	94.33	»	126.5..	93.42	»	* Unstable.		

o 1.1 = $o C_6H_4.OH.COOCs.H_2O$; *o* 1.$^1/_2$ = $o C_6H_4.OH.COOCs.^1/_2H_2O$; *o* 1.0 = $o C_6H_4.OH.COOCs$;
m 1.*x* = $m C_6H_4.OH.COOCs.xH_2O$; *m* 1.0 = $m C_6H_4.OH.COOCs$;
p 1.1 = $p C_6H_4.OH.COOCs.H_2O$; *p* 1.0 = $p C_6H_4.OH.COOCs$.

CAESIUM BROMATE $CsBrO_3$.

SOLUBILITY OF CAESIUM BROMATE IN WATER.
(Mc Crosky and Buell, 1920; Buell and Mc Crosky, 1921.)

t°.	Gms. $CsBrO_3$ per 100 gms. H_2O.	Solid Phase.
25	3.66	$CsBrO_3$
30	4.53	»
35	5.32	»

CAESIUM Per CHLORATE $CsClO_4$.

One liter of saturated solution of caesium perchlorate in water contains 15.74 gms. $CsClO_4$ at 20°. (Moser and Ritschel, 1925.)

SOLUBILITY OF CAESIUM PERCHLORATE IN SEVERAL SOLVENTS AT 25°.
(Willard and Smith, 1923.)

Solvent.	*d* of solvent.	*d* of sat. sol.	Gms. $CsClO_4$ per 100 gms. sat. sol.
Water	—	1.0165	1.93
Acetone	0.7859	0.7859	0.15
n Butyl alcohol	0.8059	0.8059	0.006
iso Butyl alcohol	0.7981	0.7981	0.007
Ethyl alcohol	0.7852	0.7852	0.011
Methyl alcohol	0.7874	0.7878	0.093
n Propyl alcohol	0.7993	0.7993	0.006

SOLUBILITY OF CAESIUM PERCHLORATE IN MIXTURES OF ETHYL ACETATE AND SEVERAL ALCOHOLS AT 25°. (Smith, 1925.)

Solvent.							Gms. $CsClO_4$ per 100 gms. sat. sol.
10 vol. per cent of	Methyl alcohol	+	90 vol. per cent	Ethyl acetate	..		0.0050
20 »	»	+	80 »	»	..		0.0056
10 »	Ethyl	+	90 »	»	..		0.0013
20 »	»	+	80 »	»	..		0 0023
20 »	93 % »	+	80 »	»	..		0.0040
10 »	*n* Butyl	+	90 »	»	..		0.0009
20 »	»	+	80 »	»	..		0.0012

CAESIUM CHLORIDE $CsCl$.

100 gms. sat. sol. of caesium chloride in selenium oxychloride ($SeOCl_2$) contain 3.83 gms. $CsCl$ at 25°. (Wise, 1923.)

CAESIUM Platinum CHLORIDE Cs_2PtCl_6.

Solubility of Caesium Platinum Chloride in Water. (Archibald and Hallett, 1925.)

t°.	Gms. Cs_2PtCl_6 per 100 gms. H_2O.	t°.	Gms. Cs_2PtCl_6 per 100 gms. H_2O.	t°.	Gms. Cs_2PtCl_6 per 100 gms. H_2O.
0.....	0.0047	40.....	0.0158	80.....	0.0525
10.....	0.0064	50.....	0.0212	90.....	0.0675
20.....	0.0086	60.....	0.0290	100.....	0.0915
30.....	0.0119	70.....	0.0389		

The authors consider that the higher values for this compound reported by Bunsen, are due either to hydrolysis or the presence of potassium compounds in the salt.

CAESIUM Thallium CHLORIDES.

Equilibrium in the System Caesium Chloride, Thallium Trichloride and Water at 15°. (Malquori, 1926.)

Constant agitation in a thermostat was employed. The solid phases were identified by the « rest method » of Schreinemakers.

Gms. per 100 gms. sat. sol.				Gms. per 100 gms. sat. sol.			
$TlCl_3$.	CsCl.	H_2O.	Solid Phase.	$TlCl_3$.	CsCl.	H_2O.	Solid Phase.
65.170	–	34.830	$TlCl_3.4H_2O$	–	8.313	91.687	2.2.2
65.178	–	34.822	»+2.3	–	12.450	87.550	»
61.180	–	38.820	2.3	–	20.020	79.980	»
54.913	–	45.087	»	–	26.930	73.070	»
50 127	–	49.873	»	–	27.173	72.827	»+1.3.1
40.970		59.030	»		27.689	72.311	1.3.1
31.705		68.295	»		32.721	67.279	»
16.481	–	83.519	»	–	42.100	57.900	»
10.210	–	89.790	»	–	45.201	54.799	»+1.3
6.573	0.021	93.406	»		45.910	54.090	1.3
1.451	1.123	97.426	»		50.00	50.0	»
0.739	2.371	96.900	»		58.170	41.830	»
0.017	3.201	96.782	»		63.981	36.019	»
	3.272	96.728	»+2.2.2	–	64.713	35.287	»+CsCl
	3.272	96.718	2.2.2	–	64.750	35.250	CsCl

$2.3 = 2TlCl_3.3CsCl$; $2.2.2 = 2TlCl_3.2CsCl.2H_2O$; $1.3.1 = TlCl_3.3CsCl.H_2O$; $1.3 = TlCl_3.3CsCl$.

CAESIUM FORMATE $HCOOCs.H_2O$.

Solubility of Caesium Formate in Water. (Sidgwick and Gentle, 1922.)

t°.	Gms. HCOOCs per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. HCOOCs per 100 gms. sat. sol.	Solid Phase.
-0.77....	4.00	Ice	42.7.....	88.67	$HCOOCs.H_2O$
1.72....	8.11	»	44.6.....	90.42	»
3.44....	14.29	»	45.0 m. pt..	–	»
5.27....	19.62	»	43.8.....	92.54	»
-8.12....	26.75	»	42.6.....	93.47	»
+1.0....	77.07	$HCOOCs.H_2O$	41.0 tr. pt..	–	»+HCOOCs
21.0....	81.69	»	95.4.....	95.27	HCOOCs
26.2....	83.25	»	161 6.....	96.67	»
32.2....	84.81	»	265.0 m. pt..	100.00	»
39.2....	86.88	»			

CAESIUM PICRATE, CAESIUM Bi TARTRATE etc.

Solubility of Each in Water at 20°.

(Moser and Ritschel, 1925.)

Compound.	Formula.	Gms. cmpd. per 1000 cc. sat. sol.
Caesium picrate.....	$C_6H_2(NO_2)_3OCs$	3.08
Caesium bitartrate.....	$Cs.HC_4H_4O_6$	71.13
Caesium silicomolybdate	–	0.4
Caesium phosphotungstate ...	–	0.04

CAFFEINE $C_5H(CH_3)_3N_4O_2.H_2O$.

Equilibrium in the Binary System Caffeine-Water, Determined by the Thermic Method.

(Kremann and Janetzky, 1923.)

The equilibrium temperatures in known mixtures of the two constituents were determined either by the freezing-point method, by observation of the appearance or disappearance of the last crystals, or by means of the points of arrest or change of direction in time-cooling curves.

t° of primary crystalization.	Wt. Per cent of $C_5H(CH_3)_3N_4O_2$ in mixture.	Solid Phase.	t° of primary crystalization.	Wt. Per cent of $C_5H(CH_3)_3N_4O_2$ in mixture	Solid Phase.
— 0.2	0.5	Ice	54.5	20.0	$C_5H(CH_3)_3N_4O_2.H_2O$
— 0.3	1.9	»	58.5	25.0	»
— 0.4 (Eutec.)	4.0	»+$C_5H(CH_3)_3N_4O_2.H_2O$	61.0	31.0	»+$C_5H(CH_3)_3N_4O_2$
+13.0	4.5	$C_5H(CH_3)_3N_4O_2.H_2O$	67.2	35.5	$C_5H(CH_3)_3N_4O_2$
32.5	7.2	»	73.0	40.0	»
40.5	9.6	»	81.5	45.6	»
49.5	15.0	»	100.0	59.0	»

100 gms. sat. solution of caffeine in water contain 1.224 gms. caffeine at 15° and 2.119 gms. at 25°. (Oliveri-Mandala, 1926.)

100 cc. sat. solution of hydrated caffeine in water contain 2.071 gms. caffeine at 25°. (Emery and Wright, 1921.)

Solubility of Caffeine in Aqueous Solutions of Chloral Hydrate.

(Oliveri-Mandala, 1926.)

Results at 15°.		Results at 25°.	
Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
$CCl_3.CH(OH)_2$.	$C_5H(CH_3)_3N_4O_2$.	$CCl_3.CH(OH)_2$.	$C_5H(CH_3)_3N_4O_2$.
5.216	2.173	5.216	3.228
7.124	2.992	7.124	5.236
8.924	4.096	8.924	4.897

100 gms. of sat. solution of caffeine in 6.667 % aqueous sodium benzoate solution contain 8.321 gms. caffeine at 25°. (Oliveri-Mandala, 1926.)

Solubility of Hydrated Caffeine in Various Aqueous Solutions at 25°.

(Emery and Wright, 1921.)

Aqueous solution.	Gms. $C_5H(CH_3)_3N_4O_2$ per 100 cc. sat. sol.	Aqueous solution.	Gms. $C_5H(CH_3)_3N_4O_2$ per 100 cc. sat. sol.
1.0 Normal sulfuric acid.....	0.3356	1.0 Normal sodium salicylate..	2.222
1.0 » citric acid.....	0.6412	0.1 » » ..	0.492
1.0 » potassium bromide..	0.2136	1.0 » sodium benzoate..	1.528
2.5 » » » ..	0.2036	0.1 » » » ..	0.342

100 gms. Glycerol of d = 1.2326 (86.5 %) dissolve 0.59 gms. caffeine at 20°. (Holm, 1921-1922.)
100 gms. » d = 1.2645 (98.5 %) » 0.47 » » » »

Solubility of Caffeine in Several Solvents.

Solvent.	t°.	Gms. Caffeine per 100 gms. solvent.	Authority.
Abs. alcohol	20–25	1.88	(Pucher and Dehn, 1921.)
Quinoline	»	3.56	»
Equi. mol. mixture of alcohol + quinoline	»	3.93	»
Para cymene (b. pt. 176–176.5)	25	0.76	(Wheeler, 1920.)
»	30	1.10	»
»	100	1.74	»
»	175	15.58	»

Distribution of Caffeine at 25° Between : (Emery and Wright. 1921.)

Water and Chloroform.		1.0 Normal Aq. H_2SO_4 and $CHCl_3$.		1.0 Normal Aq. KBr and $CHCl_3$.	
Gms. Caffeine per 100 cc.		Gms. Caffeine per 100 cc.		Gms. caffeine per 100 cc.	
Aq. layer.	$CHCl_3$ layer.	Aq. layer.	$CHCl_3$ layer.	Aq. layer.	$CHCl_3$ layer.
0.0084	0.1916	0.0186	0.1814	0.0067	0.1933
0.0172	0.3828	0.0384	0.3618	0.0164	0.3836
0.0538	0.9472	0.1060	0.8940	0.0496	0.9504
0.1260	1.8740	0.2264	1.7736	0.118	1.8820
0.44	4.56	0.693	4.307	0.433	4.567
1.35	8.65	1.834	8.166	1.329	8.671

Distribution of Caffeine at 25° Between : (Emery and Wright, 1921.)

0.1 Normal Sodium Salicylate and Chloroform.		0.1 Normal Sodium Benzoate and Chloroform.	
Gms. Caffeine per 100 cc.		Gms. Caffeine per 100 cc.	
Aq. layer.	$CHCl_3$ layer.	Aq. layer.	$CHCl_3$ layer.
0.0292	0.1708	0.0144	0.1856
0.0608	0.3392	0.0304	0.3696
0.1624	0.8376	0.0848	0.9152
0.3412	1.6588	0.1872	1.8128
0.9830	4.017	0.625	4.375
2.367	7.633	1.751	8.249

The authors also give data upon the effect of temperature, small amounts of alcohol, acid, and other substances in solution, upon the distribution of caffeine between water and chloroform. Although the results are expressed in terms of percentage of recovery by extracting caffeine from aqueous solutions with chloroform, they can all be calculated, as have the above, to the form here shown.

Distribution of Caffeine and of Ethoxy Caffeine Between Water or Serum and Olive Oil. (Aiello, 1921.)

Immiscible solvents.	Results for :	t°.	Gms. Caffeine or of Ethoxy Caffeine per 100 cc. Aq. layer (*a*).	Oil layer (*o*).	$\frac{o}{a}$.
Water and olive oil	Caffeine	15	0.651	0.349	0.53
» »	»	16	0.695	0.315	0.44
» »	»	17	0.725	0.275	0.37
» »	Ethoxy Caffeine	?	0.107	0.193	1.80
» »	»	?	0.111	0.189	1.70
Horse serum and olive oil.	Caffeine	18	1.150	0.292	0.25
» »	»	20	1.358	0.145	0.10
» »	Ethoxy Caffeine	19	0.135	0.036	0.26
» »	»	20	0 151	0.029	0.19

100 cc. Horse serum dissolve 1.442 gms. caffeine at 18° and 1.503 gms. at 20°.
» » » 0.171 gms. ethoxy caffeine at 19° and 0.180 gms. at 20°.

CALCIUM Methyl**ADIPATE**

CALCIUM Racemic β Methyl**ADIPATE** $CH_2CH_2CHCH_3CH_2(COO)_2Ca$.

100 cc. of saturated solution of the neutral calcium salt of racemic β methyl adipic acid in water contain 5.3 gms. of the compound at 15°. (Meurisse.)

CALCIUM ARSENATES $CaHAsO_4.H_2O$, $CaH_4(AsO_4)_2$ etc.

EQUILIBRIUM IN THE SYSTEM CALCIUM OXIDE, ARSENIC PENTOXIDE AND WATER AT 35° (ACID REGION). (Smith, 1920.)

An excess of Ca O was added to aqueous solutions containing increasing amounts of arsenic acid. The mixtures were rotated continuously at 35° and the solutions analyzed at the end of 10 days and 17 days.

Density of sat. sol.	Gms. per liter of sat. sol. CaO.	As_2O_5.	Solid Phase.	Density of sat. sol.	Gms. per liter of sat. sol. CaO.	As_2O_5.	Solid Phase.
0.996	0.956	1.372	—	1.480	79.0	518.4	$CaH_4(AsO_4)_2$
1.025	7.20	27.79	$CaHAsO_4.H_2O$	1.590	64.7	690.5	»
1.09	20.74	87.00	»	1.697	50.1	853.6	»
1.157	37.09	150.1	»	1.795	33.6	995.0	»
1.242	57.0	232.3	»	1.975	16.2	1230.0	»
1.261	58.2	252.1	»	2.167	2.93	1539.0	»
1.300	69.4	285.6	»	2.217	2.53	1599.0	» $+3As_2O_5.5H_2O$
1.413	92.5	405.4	$CaH_4(AsO_4)_2$				

Data for the system calcium oxide, arsenic trioxide and water at 0°, 25° and 99° are given by Story and Anderson, 1924.

1 liter of water sat. with $CaHAsO_4$ contains 3.10 gms. of the compound at 25°.
1 » » with $Ca_3(AsO_4)_2$ » 0.13 » » » »
(Robinson, 1918.)

The author also gives a few determinations which show that the presence of calcium hydroxide greatly reduces the solubility of the above two compounds.

100 gms. H_2O dissolve 0.0048 gm. basic arsenate of calcium, $3Ca_3(AsO_4)_2.Ca(OH)_2$ at 25°. (Tartar, Wood and Hines, 1924.

CALCIUM BENZOATE $Ca(C_6H_5COO)_2.3H_2O$.

SOLUBILITY OF CALCIUM BENZOATE IN WATER.
(Stanbridge, 1918.)

t°.	Gms. $Ca(C_6H_5COO)_2$ per 100 gms. H_2O.	Solid Phase.	t°.	Gms. $Ca(C_6H_5COO)_2$ per 100 gms. H_2O.	Solid Phase.
0.1.....	0.3098	Ice	59.8.....	4.708	$Ca(C_6H_5COO)_2.3H_2O$
0.159.....	0.8964	»	69.9.....	5.675	»
-0.282.....	1.347	»	79.9.....	6.865	»
-0.308.....	1.421	»	90.2.....	8.555	» *
-0.370.....	1.760	»	84.7 (tr. pt.).	7.62	» $+Ca(C_6H_5COO)_2.H_2O$
-0.382.....	2.263	»	82.9.....	7.518	$Ca(C_6H_5COO)_2.H_2O$*
-0.369.....	3.470	»	85.0.....	7.588	»
+0.37 (E.tec.).	2.22	» $+Ca(C_6H_5COO)_2.3H_2O$	87.0.....	7.708	»
+0.2.....	2.232	$Ca(C_6H_5COO)_2.3H_2O$	89.1.....	7.850	»
9.8.....	2.453	»	91.1.....	8.005	»
19.8.....	2.723	»	93.1.....	8.135	»
29.8.....	3.016	»	95.2.....	8.379	»
39.7.....	3.424	»	97.2.....	8.464	»
49.7.....	4.048	»	100.0 (b. pt.).	8.695	»

* Metastable point.

SOLUBILITY OF SEVERAL CALCIUM BENZOATES IN WATER AT 20°.
(Ephraim and Pfister, 1925.)

Salt.	Formula.	Gms. anhydrous salt per 100 cc. sat. sol.
Calcium benzoate.....	$Ca(C_6H_5COO)_2.2H_2O$	2.827
Calcium-4-chloro benzoate....	$Ca(C_7H_4O_2Cl)_2.3H_2O$	0.737
» -4-nitro benzoate.....	$Ca(C_7H_4O_4N)_2.6H_2O$	2.548
» -4-oxy benzoate.....	$Ca(C_7H_5O_3)_2.4H_2O$	8.366
» 4-methoxy benzoate..	$Ca(C_8H_7O_3)_2.3H_2O$	2.525

CALCIUM BROMIDE $CaBr_2$.

EQUILIBRIUM IN THE SYSTEM CALCIUM BROMIDE, CALCIUM OXIDE AND WATER AT 25°. (Milikań, 1917-1918.)

Gms. per 100 gms. sat. sol. CaO.	Gms. per 100 gms. sat. sol. $CaBr_2$.	Solid Phase.	Gms. per 100 gms. sat. sol. CaO.	Gms. per 100 gms. sat. sol. $CaBr_2$.	Solid Phase.
0.0	60.07	$CaBr_2.6H_2O$	0.080	32.92	$D_{1.3.16}$
0.209	60.09	» + $D_{3.4.16}$	0.080	32.50	»
0.192	59.48	$D_{3.4.16}$	0.089	28.21	»
0.199	58.90	»	0.089	25.15	»
0.235	56.94	»	0.092	22.39	»
0.271	55.29	»	0.103	21.80	»
0.358	54.22	» + $D_{1.3.16}$	0.097	20.75	» + $Ca(OH)_2$
0.247	53.39	$D_{1.3.16}$	0.115	19.18	$Ca(OH)_2$
0.132	50.04	»	0.101	13.75	»
0.098	44.21	»	0.119	9.28	»
0.077	41.36	»	0.118	0.0	»

$D_{3.4.16} = 3CaBr_2.4CaO.16H_2O$. $D_{1.3.16} = CaBr_2.3CaO.16H_2O$.

SOLUBILITY OF CALCIUM BROMIDE IN ABSOLUTE ETHYL ALCOHOL.
(Bonnell and Jones, 1926.)

t°.	Gms. $CaBr_2$ per 100 gms. C_2H_5OH.	Solid Phase.	t°.	Gms. $CaBr_2$ per 100 gms. C_2H_5OH.	Solid Phase.
0.....	46.70	$CaBr_2.4C_2H_5OH$	50.....	65.64	$CaBr_2.3C_2H_5OH$
10.....	48.01	»	60.....	76.02	»
15.....	50.51	»	70.....	93.81	»
17 (tr. pt.)		» + $CaBr_2.3C_2H_5OH$	73.9 (tr. pt.)		» + $CaBr_2.C_2H_5OH$
20.....	53.50	$CaBr_2.3C_2H_5OH$	75.....	102.20	$CaBr_2.C_2H_5OH$
25.....	53.95	»	80.....	103.10	»
30.....	55.52	»	85.....	106.10	»
40.....	60.11	»			

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given by Kellner, 1917, for mixtures of $CaBr_2$ and each of the following salts : Li Br, Na Br and KBr.

CALCIUM CARBONATE $CaCO_3$.

One liter of sat. solution of carefully washed $CaCO_3$ in boiled distilled H_2O, contains 0.01447 gm. $CaCO_3$ at 17°. (Stumper, 1925.)

SOLUBILITY OF CALCITE AND OF ARAGONITE IN WATER CONTAINING CARBON DIOXIDE. (Bäckström, 1921.)

The aragonite was prepared by heating in a sealed tube to 140°, a 1.0 molecular solution of $CaCl_2$ (sat. with CO_2) and urea. It contained 0.5 % calcite and 0.6 % urea. The calcite was obtained by grinding Iceland spar and removing all particles smaller than 10 μ by decanting with conductivity water. Equilibrium was not reached with calcite because of the extremely small velocity of the reaction. The most likely values are given.

		Results for Aragonite.			Results for Calcite.		
t°.	Pressure of CO_2.	Sp. conductivity $\varkappa.10^{-3}$.	Gm. equiv. $CaCO_3$ per liter.	Gm. $CaCO_3$ per liter.	Sp. conductivity $\varkappa.10^{-3}$.	Gm. equiv. $CaCO_3$ per liter.	Gm. $CaCO_3$ per liter.
9..	777 mm	1.534	0.0291	1.46	1.39	0.0260	1.30
25..	762	1.723	0.0213	1.066	1.547	0.01884	0.943
35..	742	1.774	0.01751	0.876	1.573	0.01529	0.765

Solubility of Calcite in Sea Water. (Wells, 1918.)

In a previous paper (1915) the author showed that the solubility of calcite in water in contact with air is a function of the temperature. In the present case an excess of calcite was suspended in sea water and agitated by a current of out-door air for long intervals at different temperatures, and the dissolved carbonate determined by titration with 0.02 normal $NaHSO_4$ solution, using methyl orange as the indicator. The results show that « there is a tendency for the colder sea water to retain more carbonate in solution than the warmer sea water.... Ordinary sea water appears to contain so much carbonate that, in contact with the atmosphere at 1° C. it neither has, nor acquires an appreciable solvent action on calcite. »

Solubility of Calcium Carbonate of Different Origins and Fineness in Water Containing Carbon Dioxide. (Hager and Kern, 1916-1920.)

The authors show that the degree of fineness influences greatly the velocity of solution of calcium carbonate in water containing CO_2. The shorter the period of action, the more pronounced are the differences observed. The variations increase with increase of CO_2 in the water.

The Equilibrium Constants for Aqueous Systems Containing Calcium Carbonate and Other Salts at 38°. (Kugelmass and Shohl, 1924.)

The authors determined the equilibrium constants for the systems (1) $CaCO_3 + Ca(HCO_3)_2 + CO_2$, (2) $CaCO_3 + Ca(HCO_3)_2 + NaHCO_3 + CO_2$ and (3) $CaCO_3 + Ca(HCO_3)_2 + CaHPO_4 + Ca(H_2PO_4)_2 + CO_2$. The CO_2 tensions varied from 17 to 110 mm. The several constants are discussed in connection with similar values previously obtained by others.

The Solubility of Calcium Carbonate in Aqueous Salt Solutions and Biological Fluids at 38°. (Hastings, Murray and Sendroy Jr., 1927.)

It is pointed out that a knowledge of the factors affecting the precipitation and solution of calcium carbonate and calcium phosphate, is necessary for the elucidation of such physiological problems as bone and tooth formation and such pathological problems as rickets and arteriosclerosis. An extensive study has, therefore, been made of the solubility of calcium carbonate, of calcium phosphate and of mixtures of the two in salt solutions and in biological fluids. The experimental data given in this first section of the paper include determinations of the solubility of $CaCO_3$ in aqueous $NaCl$ and $NaHCO_3$ solutions and in aqueous sodium citrate solutions. Results for the solubility in serum are then given and particular attention is paid to the effect upon this solubility of the variation of such factors as time of shaking, concentration of the serum, its calcium and protein content, and the $p\alpha_{II+}$ value of the medium.

Simultaneous Solubility of Calcium Carbonate and Calcium Phosphate in Aqueous Salt Solutions and Biological Fluids at 38°. (Sendroy Jr. and Hastings, 1927.)

Experiments of the general type mentioned above are reported. In the case of the results with serum, it was found that the amount of the two salts dissolved is directly proportional to the serum content of the solution. It was observed that calcium exists in serum in abnormal amounts and is bound to some substance or substances which hold it in solution in unionized form.

Solubility of Calcium Carbonate in Water in Contact with Carbon Dioxide under High Pressures.

Results at 18°. (Haehnel, 1924.)		Results at 25°. (Mitchell, 1923.)		
			Mols. per liter of sat. sol.	
Atmospheres pressure of CO_2.	Gms. $CaCO_3$ dissolved per 100 gms. sat. sol.	Atmospheres pressure of CO_2.	Total [Ca].	Total [CO_2].
1.....	0.108 = 0.175 gm. $Ca(HCO_3)_2$	4.....	0.0180	0.1702
2.....	0.140	6.....	0.0195	0.240
4.....	0.182	8.....	0.0213	0.3103
6.....	0.211	10.....	0.023	0.3805
10.....	0.256	12.....	0.025	0.4482
14.....	0.283	14.....	0.0265	0.4860
18.....	0.307	16.....	0.0267	0.5877
25.....	0.342	18.....	0.0267	0.6367
35.....	0.380	20.....	0.0267	0.7541
56.....	0.393 = 0.64 gm. $Ca(HCO_3)_2$	24.....	0.02674	0.8132

In the case of the determinations by Haehnel the mixture was contained in a glass vessel placed inside an autoclave which was shaken six times per hour. By inverting the autoclave the saturated solution was filtered through a thimble into a receiver. Thus the entire operation was conducted at the selected pressure of CO_2. The stability limit at 18° is at 35-40 atmospheres pressure. Different kinds of $CaCO_3$ gave essentially the same results. Equilibrium was approached from above in each case since saturation was first effected at 56 atmospheres pressure and the pressure successively reduced and aliquots withdrawn for analysis. The author also used another apparatus provided with an electrically driven stirrer.

In the case of the determinations by Mitchell a steel bulb, provided with an inner silver lining, was employed. The suspension of the finely divided calcite was stirred by a stream of gas passing through the liquid at the given pressures. The sat. solution was forced out by pressure through a filter of cotton wool. The entire apparatus was kept in an oil bath maintained at 25°. No neutral carbonate was present since in all cases the molecular ratio of CO_2 to Ca in solution, was greater than 2 : 1. This author also gives results for the solubility of mixtures of calcite and magnesium carbonate trihydrate, and for Algerian dolomite in water containing various pressures of CO_2 at 25°.

Solubility of Calcium Carbonate in Water in Contact with Carbon Dioxide at 56 Atmospheres Pressure at Different Temperatures.

(Haehnel, 1924.)

The determinations were made as described above.

t°.	Gms. $CaCO_3$ per 100 gms. sat. sol.	t°.	Gms. $CaCO_3$ per 100 gms. sat. sol.
18.....	0.393	45.....	0.339
25.....	0.403	55.....	0.255
35.....	0 380		

Data for the solubility of $CaCO_3$ at 19°-21° in steer serum in contact with different amounts of CO_2 are given by Irving, 1926.

Solubility of Calcium Carbonate in Aqueous Solutions of Sodium Carbonate at 13°.

(Pratolongo. 1924.)

Gms. per liter of sat. sol.		
Na_2CO_3.	$CaCO_3$.	Solid phase.
0.0	0.013	Calcite
10 0	0.007	»
50.0	0.005	Gay Lussite-$Na_2CO_3.CaCO_3$
150.0	0.000	Na_2CO_3

SOLUBILITY OF CALCIUM CARBONATE IN AQUEOUS SALT SOLUTIONS AT 25°.
(Askew, 1923.)

Flasks of Jena glass, provided with mercury-sealed stirrers, were used. After constant stirring for several days the Ca in the solution was estimated as oxide or sulfate. The effect of traces of CO_2 is very great since ordinary distilled water gave much higher values than freshly boiled water. Thus :

Ordinary distilled water gave 19.6×10^{-5} gm. mols $CaCO_3$ per liter, and
Gas free » » 13.4×10^{-5} » » »

Gm. mols $CaCO_3 \times 10^{-5}$ per liter of aqueous salt solution of concentration ;

Salt used.	M/1000	M/800	M/600	M/500	M/400	M/200	M/150	M/100	M/50
NaCl....	16.1	16.1	17.9	17.9	17.9	24.1	25.0	28.6	52.0
»*	16.3	16.1	16.5	19.1	22.2	28.4	32.1	35.9	69.0
NaBr....	11.6	12.5	15.2	16.1	17.1	20.5	23.4	25.0	40.9
$NaClO_3$..	17.0	17.9	16.1	16.1	16.1	25.0	27.7	32 0	63.4
$NaNO_3$..	16.1	16.1	17.9	17.9	19 3	28.6	30.4	34.5	67 8
KCl....	14.3	–	15.0	–	17.0	24.1	25.0	26.8	32.0
KBr.....	15.2	–	16.1	–	–	21.4	»	24.1	41.7

* In ordinary distilled water, instead of fresly boiled distilled water.

Estimations of hydrolysis made by electromotive force measurements are also given.

Data for the solubility of calcium carbonate, obtained with solutions prepared by adding calcium chloride to aqueous mixtures of potassium carbonate and oxalate, are given by Ramann and Sallinger, 1921.

Fusion point results for systems composed of various mixtures of $CaO + CO_2 + Na_2O + K_2O + TiO_2$ and SiO_2 are given by Niggli, 1916, 1919.

CALCIUM PERCHLORATE $Ca(ClO_4)_2$.

SOLUBILITY OF ANHYDROUS CALCIUM PERCHLORATE IN SEVERAL SOLVENTS AT 25°.
(Willard and Smith, 1923.)

Solvent.	*d* of sat. sol.	Gms. $Ca(ClO_4)_2$ per 100 gms. sat. sol.
Water	1.7191	65.35
Methyl alcohol	1.6155	70.36
Ethyl »	1.4342	62.44
n Propyl »	1.3806	59.17
n Butyl »	1.2868	53.17
iso » »	1.0903	36.29
Acetone	1.1475	38.18
Ethyl acetate	1.3325	43.06
Ethyl ether	0.7098	0.26

CALCIUM CHLORIDE $CaCl_2.6H_2O$.

THE ICE CURVE FOR MIXTURES OF CALCIUM CHLORIDE AND WATER.
(Klein and Svanberg, 1920; Rodebush, 1918.)

t° of f. pt.	Gms. $CaCl_2$ per 100 gms. H_2O.	t°. of f. pt.	Gms. $CaCl_2$ per 100 gms. H_2O.
0.486.....	0.555*	–15.23.....	22.02
–1.227.....	1.387*	–29.83.....	34.87
–2.626.....	2.775*	–31.25.....	36.04
4.21.....	8.51	–51.0 (Eutec.).....	48.00
8.63.....	14.83		

* These results by Klein and Svanberg are gms. $CaCl_2$ per 100 cc. solution instead of 100 gms. H_2O.

EQUILIBRIUM IN THE SYSTEM CALCIUM CHLORIDE, CALCIUM NITRATE AND WATER AT 30°. (Barbaudy, 1923.)

Gms. per 100 gms. sat. sol. $CaCl_2$.	Gms. per 100 gms. sat. sol. $Ca(NO_3)_2$.	Solid Phase.	Gms. per 100 gms. sat. sol. $CaCl_2$.	Gms. per 100 gms. sat. sol. $Ca(NO_3)_2$.	Solid Phase.
45.0	10.81	$CaCl_2.4H_2O\alpha$	10 7	54.4	$Ca(NO_3)_2.4H_2O$
44.7	11.45	»	11 05	53.4	»
42.35	17.03	»	7.27	52.9	»
7.57	65.26	$Ca(NO_3)_2.4H_2O$	4.6	55.0	»

Equilibrium in the System Calcium Chloride, Calcium Oxide and Water. (Millikan, 1917.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
CaO.	$CaCl_2$.	Solid Phase.	CaO.	$CaCl_2$.	Solid Phase.	CaO.	$CaCl_2$.	Solid Phase.
$t°=10°$			$t°=25°$			$t°=50°$		
0.130	0	$Ca(OH)_2$	0.060	38.61	1.1.2	0.096	0.0	$Ca(OH)_2$
0.102	15.46	» +1.3.16	0.048	41.32	»	0.112	4.08	»
0.110	26.30	1.3.16	0.030	44.30	»	0.142	15.02	»
0.115	32.38	»	0.022	44.51	1.1.2+$CaCl_2.6H_2O$	0.538	29.41	»
0.140	34.60	»	0.036	44.64	»	0.436	29.57	»
0.151	35.44	» +1.1.2	0.0	44.77	$CaCl_2.6H_2O$	0.362	29.66	» +1.1.5
0.106	38.23	1.1.2	$t°=40°$			0.517	29.60	1.1.5
0.126	38.45	»	0.104	0.0	$Ca(OH)_2$	0.470	31.70	»
0.0	39.4	$CaCl_2.6H_2O$	0.455	29.38	»	0.106	35.20	»
$t°=25°$			0.609	31.93	$Ca(OH)_2$+1.1.2	0.113	36.95	» +1.1.2
0.101	5.02	$Ca(OH)_2$	0.571	31.90	»	0.146	36.82	» »
0.115	10.00	»	0.580	31.86	»	0.124	36.93	1.1.2
0.128	12.94	»	0.055	49.97	1.1.2+$CaCl_2.4H_2O$	0.069	39.43	»
0.140	15.14	»	0.0	51.18	$CaCl_2.4H_2O$	0.051	45.57	»
0.145	17.20	»	$t°=45°$			0.046	46.42	»
0.148	18.15	» +1.3.16	0.100	0.0	$Ca(OH)_2$	0.034	47.19	»
0.147	21.02	1.3.16	0.621	31.72	$Ca(OH_2)$+1.1.2	0.046	48.75	»
0.146	23.80	»	0.634	31.95	»	0.058	54.05	1.1.2+$CaCl_2.2H_2O$
0.147	24.33	»	0.442	35.87	1.1.2	0.0	56.95	$CaCl_2.2H_2O$
0.170	28.37	»	0.069	38.12	»	$t°=48°$		
0.180	29.54	»	0.074	43.31	»	0.434	31.80	$Ca(OH)_2$+1.1.5
0.225	32.67	»	0.047	52.10	»	–	31.73	»
0.245	33.21	» +1.1.2	0.121	59.96	1.1.2+$CaCl_2.2H_2O$	0.320	32.86	1.1.5+1.1.2
0.173	34.36	1.1.2	0.0	57.19	$CaCl_2.2H_2O$			

Equilibrium in the System Calcium Oxide, Hydrochloric Acid and Water at 25°. (Millikan, 1918.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
CaO.	HCl.	Solid Phase.	CaO.	HCl.	Solid Phase.	CaO.	HCl.	Solid Phase.
14.05	40.10	$CaCl_2.2H_2O$	22.02	30.57	$CaCl_2.6H_2O$	14.50	18.64	1.3.16
14.43	40.07	$CaCl_2.2H_2O$ + $CaCl_2.4H_2O$	22.62	29.42	»	12.44	15.99	»
14.11	38.84	$CaCl_2.4H_2O$	22.56	29.31	» +1.1.2	12.17	15.64	»
17.36	35.52	»	22.41	29.11	1.1.2	10.77	13.81	»
17.39	35.38	»	20.92	27.15	»	9.28	11.88	1.3.16+$Ca(OH)_2$
18.52	34.87	»	19.56	25.37	»	8.83	11.30	$Ca(OH)_2$
19.44	34.46	»	17.53	22.58	»	7.79	9.95	»
21.77	33.35	»	17.15	22.00	» +1.3.16	6.66	8.50	»
22.48	32.57	$CaCl_2.4H_2O$ + $CaCl_2.6H_2O$	16.73	21.47	1.3.16	5.17	6.57	»
22.08	31.68	$CaCl_2.6H_2O$	15.10	19.41	»	2.64	3.30	»

1.3.16 = $CaCl_2.3CaO.16H_2O$;
1.1.2 = $CaCl_2.CaO.2H_2O$;
1.1.5 = $CaCl_2.CaO.5H_2O$ (or $4H_2O$).

Solubility of Calcium Chloride in Aqueous Solutions of Hydrochloric Acid at 25°. (Millikan, 1918.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$CaCl_2$.	HCl.	Solid Phase.	$CaCl_2$.	HCl.	Solid Phase.
44.77	0.0	$CaCl_2.6H_2O$	36.66	10.78	$CaCl_2.4H_2O$
43.59	1.92	»	34.43	12.75	»
43.71	2.96	»	34.36	12.94	»
44.50	3.33	»+$CaCl_2.4H_2O$	27.94	20.48	»
43.10	5.03	$CaCl_2.4H_2O$	28.45	21.40	»+$CaCl_2.2H_2O$
38.49	9.17	»	27.81	21.83	$CaCl_2.2H_2O$

Solubility of Calcium Chloride in Aqueous Solutions of Magnesium Chloride and Vice Versa at 25°. (Lee and Egerton, 1923.)

$d_{\frac{25}{25}}$ of sat. sol.	Gms. per 100 gms. sat. sol.			$d_{\frac{25}{25}}$ of sat. sol.	Gms. per 100 gms. sat. sol.		
	$CaCl_2$.	$MgCl_2$.	Solid Phase.		$CaCl_2$.	$MgCl_2$.	Solid Phase.
1.470	45.06	0.0	$CaCl_2.6H_2O$	1.455	31.17	14.54	1.2.12+$MgCl_2.6H_2O$
1.465	41.87	4.06	»	1.441	28.12	16.31	$MgCl_2.6H_2O$
1.472	38.95	7.93	»	1.428	25.09	18.13	»
1.486	38.70	9.43	»+1.2.12	1.391	16.05	23 33	»
1.473	36.37	10.78	1.2.12	1.371	10.33	27.61	»
1.460	32.82	13.55	»	1.341	0 0	35.54	»

1.2.12 = Tachhydrite = $CaCl_2.2MgCl_2.12H_2O$.

Solubility of Calcium Chloride in Aqueous Solutions of Potassium Chloride and Vice Versa.

	Results at 25°. (Lee and Egerton, 1923.)			Results at 30°. (Barbaudy, 1923.)		
$d_{\frac{25}{25}}$ of sat. sol.	Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
	$CaCl_2$.	KCl.	Solid Phase.	$CaCl_2$.	KCl.	
1.47	45.06	0.0	$CaCl_2.6H_2O$	50.0	0.3	$CaCl_2.4H_2O\alpha$
–	44.73	3.28	»	49.6	2.1	»
1.485	44.72	3.06	»	49.5	3.35	»
1.485	44.66	3.05	»+KCl	49.2	4.4	»+KCl
1.402	37.82	3.15	KCl	46.8	4.0	KCl
1.349	32.34	3.72	»	30.3	4.85	»
1.273	23.15	7.52	»	24.0	7.9	»
1.236	16.55	11.64	»	16.0	12.85	»
1.204	8.53	17.63	»	9.25	18.5	»
1.182	0.00	26.74	»	2.33	24.8	»

Solubility of Calcium Chloride in Aqueous Solutions of Potassium Nitrate at 30° and Vice Versa.

(Barbaudy, 1923.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$CaCl_2$.	KNO_3.	Solid Phase.	$CaCl_2$.	KNO_3.	Solid Phase.
50.4	3.67	$CaCl_2.4H_2O\alpha$	26.2	14.2	KCl
50.7	5.1	»	24.2	17.6	»
50.7	5.2	»+KCl	22.7	19.8	»
50.3	5.2	KCl	21.8	21.5	»
42.5	5.42	»	20.3	24.6	»
38.3	5.82	»	19.8	25.3	»
34.8	6.4	»	19.6	26.0	»+KNO_3
31.1	7.64	»	19 4	26.0	KNO_3
29.9	10.3	»	17.8	25.9	»
28.6	11.9	»	14.37	26.3	»
27.8	12.4	»	11.3	27.0	»
36.9	13.5	»	9.5	27.6	»

SOLUBILITY OF CALCIUM CHLORIDE IN AQUEOUS SOLUTIONS OF SODIUM CHLORIDE AT 50° AND AT 94°.5 AND VICE VERSA. (Pelling and Robertson, 1913.)

Results at 50°.

Gms. per 100 gms. sat. sol.		
$CaCl_2$.	NaCl.	Solid Phase.
57.0	0.0	$CaCl_2.2H_2O$
56.3	0.9	»+NaCl
30.9	3.6	NaCl
15.1	13.2	»
3.3	24.4	»
0.0	26.8	»

Results at 94°.5.

Gms. per 100 gms. sat. sol.		
$CaCl_2$.	NaCl.	Solid Phase.
58.1	0.8	$CaCl_2.2H_2O$ + NaCl
57.4	1.1	NaCl
45.7	1.3	»
32.8	4.3	»
15.3	15.0	»
11.5	18.1	»

100 gms. pyridine dissolve 1.66 gms. $CaCl_2$ at 25°. (Müller, R., 1924.)

100 gms. sat. solution of $CaCl_2$ in selenium oxychloride ($SeOCl_2$) contain 6.11 gms. $CaCl_2$ at 25°. (Wise, 1923.)

Fusion point Data are given for the following systems :

$CaCl_2$ + LiCl	(Grube and Rüdel, 1924.)
$CaCl_2$ + KCl	(Scholich, 1920; Lautsberry and Page, 1920.)
$CaCl_2$ + NaCl	» »
$CaCl_2$ + NaCl + KCl	» »

CALCIUM CINNAMATE $CaC_{18}H_{14}O_4.3H_2O$.

100 gms. sat. sol. of calcium cinnamate in water contain 0.340 gms. $CaC_{18}H_{14}O_4$ at 20°. (Ephraim and Pfister, 1925.)

CALCIUM CITRATE $Ca(C_6H_5O_7)_2.4H_2O$ and $Ca(C_6H_5O_7)_2.6H_2O$.

SOLUBILITY OF EACH IN WATER. (Chatterjee and Dhar, 1924.)

t°.	Gms. $Ca(C_6H_5O_7)_2$ per liter of aq. solution sat. with $Ca(C_6H_5O_7)_2.4H_2O$.	$Ca(C_6H_5O_7)_2.6H_2O$.
30	2.2	2.01
95	1.83	2.27

CALCIUM FERROCYANIDE $Ca_2Fe(CN)_6.12H_2O$.

SOLUBILITY OF CALCIUM FERROCYANIDE IN WATER. (Farrow, 1926.)

t°.	Density of sat. solution.	Gms. $Ca_2Fe(CN_6)$ per 100 gms. sat. sol.
24.9	1.3563	36.44
34.9	1.3662	39.22
49.8	1.3970	42.04
64.7	1.4074	44.44

CALCIUM FLUORIDE CaF_2.

SOLUBILITY OF CALCIUM FLUORIDE IN AQUEOUS SOLUTIONS OF ACETIC ACID. (Duparc, Wengen and Graz, 1925.)

t°.	Gms. CaF_2 dissolved per 100 cc. in aqueous 0.5 Normal CH_3COOH.	1.0 Normal CH_3COOH.	2.0 Normal CH_3COOH.
40	0.0153	0.0175	0.0192
60	0.0178	0.0203	0.0229
80	0.0206	0.0237	0.0267
100	0.0229	0.0264	0.0300

Fusion point data for mixtures of CaF_2 and NaF are given by Fedotieff and Iljinsky, 1923.

CALCIUM FORMATE $Ca(HCOO)_2$.

Fusion point data for mixtures of $Ca(HCOO)_2$ and HCOOH are given by Kendall and Adler, 1921.

CALCIUM FUMARATES $CaC_4H_2O_4.3H_2O$ and (Acid Fumarate), $Ca(C_4H_3O_4)_2.2H_2O$.

100 gms. H_2O sat. with $CaC_4H_2O_4.3H_2O$ contain 1.56 gms. $CaC_4H_2O_4$ at 30°.
» » » $Ca(C_4H_2O_4)_2.2H_2O$ » 5.19 » $Ca(C_4H_3O_4)_2$ »
(Weiss and Downes, 1923.)

CALCIUM GLYCEROPHOSPHATES α and β.

Solubility of Calcium Glycerophosphates in Water.
(Bailly, 1919.)

Name of compound.	Formula.	t°.	Gms. anhydrous cmpd. per 100 gms sat. sol.
Calcium glycero phosphate	$CaC_3H_7O_2.PO_4.H_2O$	16	4.88
» α » (amorphous)	$CaC_3H_7O_2.PO_4H_2O$	14	5.00
» » » »	»	16	4.91
» » » »	»	20	3.63
» » » »	»	75	1.29
» » » (crystalline)	»	14	3.95
» » » »	»	18	1.70
» » » »	»	20	1.36
» β » (anhydrous)	$CaC_3H_7O_2.PO_4$	18	0.99
» » » »	»	12	1.15
» » » (hydrated)	$CaC_3H_7O_2.PO_4.1^1/_4H_2O$	18	1.16
» » » »	»	12	1.31
» » » (crystalline)	$CaC_3H_5(OH)_2.PO_4?H_2O$	14	4.95
» » (neutral)	$CaC_2H_4(OH).PO_4.H_2O$	16	0.30*
» » (acid)	$Ca[H.C_2H_4(OH).PO_4]_2$	16	3.99*

* Determination by Bailly and Gaumé, 1924.

100 gms. H_2O dissolve 1.0 gm. calcium glycerophosphate at 0°, 1.68 gm. at 16° and 0.43 gm. at 60°. (H. Rogier, These, Paris, 1912.)

100 gms. glycerol ($d=1.2326=86.5\%$) dissolve 4.15 gms. calcium glycero phosphate at 20°.
» » ($d=1.2645=98.5\%$) » 3.98 » » » » »
(Holm, 1921, 1922.)

CALCIUM HELIANTHATE $Ca(C_{14}H_{14}N_3SO_3)_2.4H_2O$.

1000 cc. H_2O dissolve 0.177 gms. calcium helianthate at 20-25°. (Stark and Dehn, 1918.)

CALCIUM HYDROXIDE $Ca(OH)_2$.

Solubility of Calcium Hydroxide in Water.
(Haslam, Calingaert and Taylor, 1924.)

Equilibrium was approached from above and from below. The excess of lime was allowed to settle and the clear supernatant solution titrated, using phenolphthalein as indicator.

t°.	Gms. CaO per 1000 gms. sat. sol.	t°.	Gms. CaO per 1000 gms. sat. sol.	t°.	Gms. CaO per 1000 gms. sat. sol.
10	1.310	56	0.884	66	0.802
42	1.018	60	0.855	70	0.762
48	0.957	61	0.842	80	0.673

Data for the solubility of commercial limes in water are given by Haslam, Whitman and Cochran, Jr. 1924. The results show that these limes do not vary more than 7 per cent from the solubility of pure calcium oxide. The differences are probably due to the presence of small amounts of sodium and potassium hydroxide in commercial limes. The content of MgO, SiO_2 or carbonate have no effect upon the solubility of ordinary lime, but may have a marked effect upon its rate of solution.

EQUILIBRIUM IN THE SYSTEM CALCIUM OXIDE, CALCIUM IODIDE AND WATER AT 25°.
(Milikan, 1917.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
CaO.	CaI_2.	Solid Phase.	CaO.	CaI_2.	Solid Phase.	CaO.	CaI_2.	Solid Phase.
0.118	0.0	$Ca(OH)_2$	0.089	31.33	1.3.16	0.047	49.70	1.3.16
0.076	9.14	»	0.075	33.00	»	0.139	59.34	»
0.089	17.42	»	0.064	40.30	»	0.587	66.72	»+$CaI_2.6H_2O$
0.087	25.80	»	0.054	46.37	»	0.553	66.65	» »
0.097	25.44	»+1.3.16	0.055	47.09	»	0.0	66.80	$CaI_2.6H_2O$

$1.3.16 = CaI_2.3CaO.16H_2O$.

EQUILIBRIUM IN THE SYSTEM CALCIUM HYDROXIDE, PHENOL AND WATER AT 25°.
(Van Meurs, 1916.)

Mols. per 100 mols. sat. sol.			Mols. per 100 mols. sat. sol.		
C_6H_5OH.	$\frac{Ca(OH)_2}{2}$.	Solid Phase.	C_6H_5OH.	$\frac{Ca(OH)_2}{2}$.	Solid Phase
0.0	0.06	$Ca(OH)_2$	16.72	6.95	1.3
0.40	0.46	»	25.19	7.79	»
1.25	1.35	»	30.26	8.67	»
2.11	2.19	»	35.56	8.30	»
2.63	2.63	»+1.3	38.38	8.21	»
4.82	4.20	1.3	53.19	7.56	»
7.65	5.16	»	68.25	4.08	»
11.03	6.12	»	75.25	3.60	»+C_6H_5OH
12.41	6.47	»	74.06	1.38	C_6H_5OH

$1.3 = (C_6H_5O)_2Ca.3H_2O$.

At concentrations of $Ca(OH)_2$ less than 0.55 mol. per cent two liquid layers having the following composition are formed.

Aqueous layer.		Phenol layer.	
Mol. % C_6H_5OH.	Mol. % $\frac{Ca(OH)_2}{2}$.	Mol. % C_6H_5OH.	Mol. % $\frac{Ca(OH)_2}{2}$.
1.79	0	32.33	0
2.16	0.14	23.08	0.37
2.76	0.23	18.48	0.54

CALCIUM MALATES Active and Racemic Salts.

SOLUBILITY OF EACH SEPARATELY IN WATER.
(Duboux and Cuttat, 1921.)

Results for the active salt.

t°.	Gms. anhydrous salt per 100 gms. sat. sol.	Solid Phase.
0.....	0.670	$C_4H_4O_5Ca.2H_2O$
12.5...	0.805	»
25.0...	0.921	»
37.5...	1.011	»

Results for the racemic salt.

t°.	Gms. anhydrous salt per 100 gms. sat. sol.	Solid Phase.
0.0...	0.241	$C_8H_8O_{10}Ca_2.3H_2O$
12.5...	0.277	»
25.0...	0.310	»
37.5...	0.343	»

CALCIUM MALEATE $CaC_4H_2O_4.H_2O$ and Acid Maleate $Ca(C_4H_3O_4)_2.5H_2O$.

SOLUBILITY OF EACH SEPARATELY IN WATER.
(Weiss and Downs, 1923.)

t°.	Gms. $CaC_4H_2O_4$ per 100 gms. H_2O.	Solid Phase.
25.....	2.49	$CaC_4H_2O_4.H_2O$
40.....	2.88	»

t°.	Gms. $Ca(C_4H_3O_4)_2$ per 100 gms. H_2O.	Solid Phase.
25.....	91.13	$Ca(C_4H_3O_4)_2.5H_2O$
40.....	91.89	»
60.....	94.78	»

CALCIUM MECONATE $C_7H_2O_7.Ca$.

1000 cc. of sat. sol. in 0.1 *n* aqueous ammonia contain 0.0973 gm. $C_7H_2O_7Ca$ at 18°. Heiduschka and Faul, 1917.)

CALCIUM NITRATE $Ca(NO_3)_2.4H_2O$.

Solubility of Calcium Nitrate in Aqueous Solutions of Potassium Chloride at 30° and Vice Versa. (Baubaudy, 1923.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$Ca(NO_3)_2$.	KCl.	Solid Phase.	$Ca(NO_3)_2$.	KCl.	Solid Phase.
62.4	4.8	$Ca(NO_3)_2.4H_2O$	39.0	15.83	KNO_3
65.6	6.37	»	34.56	16.0	»
73.5	9.0	$» + Ca(NO_3)_2.?H_2O$	27.18	17.14	»
59.9	13.85	$Ca(NO_3)_2.?H_2O$	23.87	18.3	»
52.35	16.0	»	20.17	20.54	»
47.83	17.56	»	17.31	23.4	»
45.8	18.2	$» + KNO_3$	16.2	24.6	$» + KCl$
44.33	16.7	KNO_3	14.65	24.74	KCl
44.2	16.6	»	8.22	25.8	»

Solubility of Calcium Nitrate in Aqueous Solutions of Potassium Nitrate at 30° and Vice Versa. (Baubaudy, 1923.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$Ca(NO_3)_2$.	KNO_3.	Solid Phase.	$Ca(NO_3)_2$.	KNO_3.	Solid Phase.
59.70	0.0	$Ca(NO_3)_2.4H_2O$	50.6	31.8	$Ca(NO_3)_2.?H_2O$
57.0	10.3	»	52.0	30.4	$» + KNO_3$
58.67	16.86	»	47.87	25.1	$KNO_3 + ?$
58.9	17.2	»	37.22	22.4	KNO_3
61.5	17.7	»	31.9	22.15	»
64.4	14.2	»	24.8	22.8	»
66.0	13.0	$» + Ca(NO_3)_2.?H_2O$	18.15	24.0	»
58.3	22.4	$Ca(NO_3)_2.?H_2O$	8.7	27.0	»

Solubility of Calcium Nitrate in Aqueous Solutions of Sodium Nitrate and Vice Versa. (Pelling and Robertson, 1923).

Resulls at 50°.

Gms. per 100 gms. sat. sol.		
$Ca(NO_3)_2$.	$NaNO_3$.	Solid Phase.
73.8	0.0	$Ca(NO_3)_2.3H_2O$
69.4	11.1	$» + NaNO_3$
62.7	11.5	»
54.7	14.8	»
52.8	14.4	»
52.3	14.9	»
39.2	21.0	»
30.7	27.4	»
22.6	34.5	»

Results at 94°.5.

Gms. per 100 gms. sat. sol.		
$Ca(NO_3)_2$.	$NaNO_3$.	Solid Phase.
78.4	0.0	$Ca(NO_3)_2$
74.6	4.3	»
68.9	14.3	»
67.2	17.4	»
66.7	18.0	$» + NaNO_3$
60.2	17.8	$NaNO_3$
47.0	24.7	»
20.5	43.9	»
0.0	62.6	»

100 cc. pyridine dissolve 5.75 gms. $Ca(NO_3)_2$ at 25° (Müller, R., 1924.)
100 cc. Iso Amyl alcohol dissolve 4.55 » »

CALCIUM OLEATE $(C_{18}H_{33}O_2)_2Ca$.
CALCIUM PALMITATE $[CH_3(CH_2)_{14}COO]_2Ca$.
CALCIUM STEARATE $[CH_3(CH_2)_{16}COO]_2Ca$.

Solubility of Each Separately in Water and in Aqueous Sodium Chloride Solutions. (Zink and Liere, 1915.)

About 0.25 gm. of each compound was rubbed with water and allowed to stand at room temperature for 36 hours. The solution was filtered and the Ca in 750 cc. determined.

	Milligrams per liter of sat. sol.		
Solvent.	$(C_{18}H_{33}O_2)_2Ca$.	$[CH_3(CH_2)_{14}COO]_2Ca$.	$[CH_3(CH_2)_{16}COO]_2Ca$.
Water.....	65.88–91 67	27.50–28.77	38.95 41.87
Aq. 0.05 % NaCl.....	77.38	39.28	46.20
0.10 »	102.5	56.27	69.24

CALCIUM PHOSPHATE (Tribasic) $Ca_3(PO_4)_2$ and (Dibasic) $CaHPO_4.2H_2O$.

The Solubility Product of Secondary and Tertiary Calcium Phosphate under Various Conditions. (Holt, Jr., La Mer and Chown, 1925.)

In connection with studies of bone calcification and the absorption and excretion of calcium and phosphorus from the body, these authors have made an extensive study of the solubilities of the sparingly soluble salts of calcium. They call attention to the inapplicability of procedures based upon dissolving $Ca_3(PO_4)_2$ and $CaHPO_4$ in water, on account of the hydrolysis of these salts. It is pointed out that for most purposes the actual molar solubility is of little importance, for the solubility of dissociable substances is defined just as accurately and even more generally in terms of the solubility product. According to this latter, the product of the molar concentrations of the ions of any insoluble salt is a constant. The principle can, therefore, be applied in systems where one or the other ion is present in excess. Thus, acid solutions in which the total calcium and total phosphate concentrations are large enough to be determined by analysis, can be used. In these cases the PO_4''' ion is only a very small fraction of the total phosphate, but this minute fraction can be accurately determined, provided the p_H of the solution and the ionization constants of H_3PO_4 are known. If such a solution is in equilibrium with the solid phase, $Ca_3(PO_4)_2$, the necessary conditions are met for evaluating the solubility product constant $K_{s.p.}$. Results are first given by the authors for a system suitable for this purpose, obtained by titrating 0.01 molar H_3PO_4 solution with saturated lime water. They determined the p_H ranges over which $CaHPO_4$ and $Ca_3(PO_4)_2$ are stable. The solubility product in terms of activities (i. e. the stoichiometric solubility product at infinite dilution) was found to be $10^{-6.4}$ for $CaHPO_2$ and $10^{-32.5}$ for $Ca_3(PO_4)_2$ at 38°. Data for the effect of salts in solution upon these solubility products are given, and the stoichiometric solubility product constant for $Ca_3(PO_4)_2$ in blood serum was found to be 10^{-26} at 38°. In a later paper by Holt (1925) it was shown that tertiary calcium phosphate is far less soluble in cerebrospinal fluid than in blood serum.

The Solubility of Tertiary Calcium Phosphate in Salt Solutions and in Biological Fluids at 38°. (Sendroy, Jr., and Hastings, 1926.)

In this paper the authors have developed the equations relating the second and the third dissociation constants of phosphoric acid to the ionic strength of the solution. They also give data for the solubility of $Ca_3(PO_4)_2$ in salt solutions and in serum. The results are for cases in which only $Ca_3(PO_4)_2$ is present as the solid phase and in which salts comparable in amount and kind to those found in serum and transudates were present.

Additional data and further discussion of the solubility of tertiary calcium phosphate and of phosphatic slags in aqueous solutions of acids and of salts are given by Aita, 1917, Cirikov, 1918 and Atkins, 1924.

The Solubility of Dicalcium Phosphate ($CaHPO_4.2H_2O$) in Water and in Aqueous Solutions at 19-22°. (Domontovitch and Sarubina, 1925.)

The determinations were made by precipitation and by solution experiments. The precipitation experiments were made by mixing, in different proportions, a 0.1 mol. solution of $CaCl_2$, a 0.1 mol. solution of KH_2PO_4 and a 0.2 mol. solution of NaOH. The mixtures were allowed to stand at room temperature (19-22°) for a long time and shaken daily. The Ca, P_2O_5 and p_H were determined. In the case of the solution experiments 1 gram per liter of freshly precipitated $CaHPO_4.2H_2O$ (made by 2 different methods) was placed in a series of different solvents and stirred by drawing purified air through the mixtures for six hours daily. The solutions were analyzed after 1, 2, 3 and 4 weeks.

Original composition of the solvent.	Composition of the saturated solution. Millimols. per liter. Ca.	P_2O_5.	Ca / P_2O_5	pH.	Total ion concentration.
Water	0.723	0.514	1.410	7.15	0.0017
»	0.798	0.451	1.770	7.24	0.0017
0.001 molecular CH_3COOH	1.398	0.704	1.980	6.46	0.0028
0.003 » »	2.993	1.550	1.930	5.71	0.006
0.005 » »	3.890	2.110	1.850	5.40	0.008
0.010 » »	7.083	3.591	1.970	4.95	0.014
0.005 » H_3PO_4	5.340	5.490	0.970	5.00	0.016
0.025 » »	2.690	2.890	0.956	5.60	0.008
0.003 » Succinic Acid	4 690	2.465	1.870	5.42	0.010
0.004 » HCl	3.990	2.324	1.720	5.41	0.013
0.004 » HCl + 0.044 mol. NaCl.	4.390	2.395	1.840	5.62	0.10
» » » + » »	4.190	2.392	1.750	5.67	0.10
0.016 » » + 0.026 »	15.960	8.591	1.860	4.53	0.10
» » » » »	15.760	8.591	1.840	4.57	0.10
0.08 » » 0.038 »	8.180	4.295	1.920	5.07	0.10
» » » » »	7.981	4.295	1.860	5.13	0.10
0.05 » NaCl	1.400	0.732	1.910	7.24	0.10
0.10 » »	1.600	0.916	1.750	7.22	0.20
0.034 » $CaCl_2$	34.70	0.672	51.600	5.71	0.10
0.005 » KH_2PO_4	0.648	5.920	0.110	5.89	0.017
» » »	1.100	24.00	0.045	5.30	0.10
0.0025 » $\left(\frac{4}{10}Na_2HPO_4 + \frac{6}{10}NaH_2PO_4\right)$	0.299	2.250	0.133	6.86	0.008
0.005 » »	0.249	3.940	0.063	6.80	0.015

The solubility product $(Ca'')(HPO_4'')$ was $10^{-6.25}$ for distilled H_2O (not free of CO_2) at 19-22°. With smaller electrolytic concentration the value of the solubility product varied between the limits $10^{-6.25}$ and $10^{-5.75}$.

Data for the solubility of mineral phosphates in aqueous 2% citric acid solutions are given by Aita, 1916. Results for superphosphates are given by Pratolongo, 1916.

The Solubility of Mono Calcium Phosphate in Water.

(Stollenwerk, 1926.)

In seeking to explain the variations in the solubility of mono calcium phosphate, reported by different persons, evidence was obtained, by means of specific gravity determinations upon samples of mono calcium phosphate heated to different temperatures, that isomeric forms exist. This isomerism was studied by vapor tension measurements and the variation in combining powers of different modifications for a given substance, such as ammonia. It was concluded that the present case is a hydrate isomerism resulting from the forcing of water molecules by warming into the interior of the entire molecule. This enlarges the structure and furnishes additional points of attachment for ammonia molecules.

Freezing-point lowering data for mixtures of tribasic calcium phosphate $Ca_3(PO_4)_2$ and sodium tetra borate ($Na_2B_4O_7$) are given by Ponomarev, 1921.

CALCIUM Methyl, Ethyl etc., PHOSPHATES.

Solubility of Each in Water. (Bailly, 1919.)

Compound.	Formula.	t°.	Gms. per 100 gms. sat.sol. Anhydrous compound.	Hydrated compound.
Calcium allyl phosphate...	$Ca.CH_2.CH\,CH_2PO_4.2H_2O$	20	–	0.28
» iso butyl » ...	$Ca.CH_2.CH(CH_3)_2.PO_4.2H_2O$	18	–	0.19
» ethyl » ...	$Ca.C_2H_5PO_4.2H_2O$	28	–	0.235
» methyl » (neutral).	$Ca.CH_3PO_4.2H_2O$	10	0.21	0.27
» » » (acid).	$Ca.[CH_3H.PO_4]_2$	17	27.42	–
» propyl » ...	$Ca.C_3H_7.PO_4.2H_2O$	18.5	–	0.251
» iso propyl » ...	$Ca.CH(CH_3)_2.PO_4.2H_2O$	24	–	0.09

CALCIUM SUCCINATE $Ca(C_2H_2O_2)_2$.

Solubility of Calcium Succinate at 25° in Aqueous Solutions of : (Walker, 1925.)

Magnesium Succinate. Gm. mols. per 1000 gms. H_2O.		Sodium Succinate. Gm. mols. per 1000 gms. H_2O.	
$Ca(C_2H_3O_2)_2$.	$Mg(C_2H_3O_2)_2$.	$Ca(C_2H_3O_2)_2$.	$Na_2(C_2H_2O_2)_2$.
0.07769	0.04121	0.08252	0.0000
0.07474	0.06179	0.08013	0.00826
0.07340	0.08230	0.07103	0.0506
0.07173	0.1231	0.06495	0.1014
0.07087	0.1631	0.06138	0.1526

CALCIUM SULFATE Anhydrite.

Solubility of Calcium Sulfate Anhydrite and of Soluble Anhydrite in Water. (Hall, Robb and Coleman, 1926.)

t°.	Gms. Anhydrite per liter sat. sol.	t°.	Gms. Soluble Anhydrite per liter sat. sol.
100.....	0.850	100.....	1.630
120.....	0.587	120.....	1.015
140.....	0.372	140.....	0.640
160.....	0.226	160.....	0.410
180.....	0.130	180.....	0.265
200.....	0.075	200.....	0.165
220.....	0.056		

Data for the solubilities in water at 20° of samples of gypsum burned for gradually increasing lengths of time at selected fixed temperatures, varying from 200° to 800°, are given by Budnikoff and Syrkin, 1922. Results are also given showing the rate of solution of two samples of gypsum burned respectively at 115° and 125°.

Solubility of Calcium Sulfate in Aqueous Solutions of Calcium Benzene Sulfonate. (Mameli, 1922.)

Results at 0°. Gms. per 100 cc. sat. sol.		Results at 25°. Gms. per 100 cc. sat. sol.		Results at 50°. Gms. per 100 cc. sat. sol.	
$Ca(C_6H_5SO_3)_2$.	$CaSO_4$.	$Ca(C_6H_5SO_3)_2$.	$CaSO_4$.	$Ca(C_6H_5SO_3)_2$.	$CaSO_4$.
0.6001	0.2351	0.3571	0.2665	0.2008	0.2580
0.9501	0.2701	0.6473	0.3186	0.6504	0.3302
1.3001	0.3011	1.0168	0.3321	1.0007	0.3610
1.6789	0.3011	1.3301	0.3429	1.3102	0.3700
2.0213	0.3011	2.7493	0.3429	2.4101	0.3700

Solubility of Calcium Sulfate in Water in Presence of Excess of Calcium Benzene Sulfonate [$Ca(C_6H_5SO_3)_2$]. (Mameli, 1922.)

t°.	0°.	25°.	37°.	50°.	70°.	90°.
Gms. $CaSO_4$ per 100 cc. sat. sol...	0.3011	0.3429	0.3660	0.3700	0.3575	0.3406

Solubility of Calcium Sulfate in Aqueous Solutions of Sodium Benzene Sulfonate at 25°. (Mameli, 1922.)

Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
$C_6H_5SO_3Na$.	$CaSO_4$.	$C_6H_5SO_3Na$.	$CaSO_4$.
0.2312	0.3144	1.0814	0.4930
0.3301	0.3430	1.7315	0.4930
0.7012	0.4350	2.3196	0.4930

Solubility of Calcium Sulfate at 25° in Aqueous Solutions of : (Harkins and Paine, 1919.)

Copper Sulfate.

	Gms. per 100 gms. sat. sol.	
$d_{\frac{25}{4}}$ of sat. sol.	$CuSO_4$.	$CaSO_4$.
1.0010	0.1996	0.18435
1.0069	0.7922	0.1671
1.0149	1.5842	0.1661
1.0324	3.267	0.17468
1.1486	13.465	0.1944

Potassium Nitrate.

	Gms. per 100 gms. sat. sol.	
$d_{\frac{25}{4}}$ of sat. sol.	KNO_3.	$CaSO_4$.
0.99911	0.0	0.20854
1.0013	0.27824	0.2454
1.0029	0.53106	0.27268
1.0088	1.0330	0.2862

Solubility of Calcium Sulfate in Aqueous Solutions of Magnesium Sulfate at 25°. (Harkins and Paine, 1919.)

Solid Phase $CaSO_4.2H_2O$.

	Gms. per 100 gms. sat. sol.	
$d_{\frac{25}{4}}$ of sat. sol.	$MgSO_4$.	$CaSO_4$.
0.99911	0.0	0.20854
0.99960	0.060294	0.19565
1.0001	0.12167	0.1848
1.00067	0.18339	0.1777

Solid Phase Selenite Plates.

	Gms. per 100 gms. sat. sol.	
$d_{\frac{25}{4}}$ of sat. sol.	$MgSO_4$.	$CaSO_4$.
0.99905	0.0	0.20658
1.0004	0.13413	0.17886
1.0018	0.33161	0.16469
1.0044	0.63148	0.15592
1.0099	1.2385	0.15912

Freezing-point data for mixtures of $CaSO_4$ and H_2SO_4 are given by Kendall and Davidson, 1921.

CALCIUM Potassium SULFATES $5CaSO_4.K_2SO_4.H_2O$ and (Syngenite). $CaSO_4.K_2SO_4.H_2O$

Solubility of Calcium Potassium Double Sulfates in Water at 100°. (Anderson and Nestell, 1920.)

The mixtures were constantly agitated at 100° for 7 to 23 days.

Gms. per 100 gms. H_2O.		Mols. per 1000 mols. H_2O.		
K_2SO_4.	$CaSO_4$.	K_2SO_4.	$CaSO_4$.	Solid Phase.
1.02	0.180	1.05	0.24	$5CaSO_4.K_2SO_4.H_2O + CaSO_4.2H_2O$
8.95	0.107	9.26	0.142	» $+ CaSO_4.K_2SO_4.H_2O$

CALCIUM SULFIDE CaS.

Solubility of Calcium Sulfide in Water in the Absence of Air. (Foerster and Kubel, 1924.)

The sample was prepared by heating calcium sulfite for 1 hour at 700-750°. It contained 12.1 % Ca S.

t°.	Minutes digested with H_2O.	Gms. sample digested per 100 gms. H_2O	Gms. Ca S dissolved per 100 cc. sat. sol.	Per cent of the used Ca S dissolved.
15.....	15	2.5414	0.0090	2.9
15.....	15	2.3759	0.0100	3.5
15.....	60	2.4707	0.0121	4.0
100.....	15	3.2079	0.1450	37.4
100.....	60	5.3080	0.4614	71.8

Solubility of Calcium Sulfide in Water and in Aqueous Solutions of Hydrogen Sulfide at 20°. (Riesenfeld and Feld, 1921.)

The sample of calcium sulfide contained $CaSO_4$, CaO and C. Water saturated with the sample at 20° contained 0.2120 gms. CaS, 0.3881 gms. $CaSO_4$ and 0.1786 gm. CaO per liter. For the solubility in presence of H_2S an apparatus constructed entirely of glass was used. The air was completely displaced with H_2S to insure that only this gas was present. The equilibrium was approached from below and from above by changing the pressure of the H_2S. The influence of time upon the attainment of equilibrium was found to be considerable, but the rate was shown to be a reaction of the first order and from it the final equilibrium could be estimated. The manometer was read in the beginning and after the solution had been shaken and from this it was known whether equilibrium was being approached from above or below. The results of the analyses in grams of S per 100 cc. were plotted and from the curves and the calculations from Henry's law of the proportion of the S in the form of H_2S, the difference gave that present as calcium sulfhydrate and calcium sulfide.

Pressure of H_2S in mm. Hg.	Gms. $Ca(HS)_2$ per 100 cc. sat. sol. at 0°.	20°.	40°.	Pressure of H_2S in mm. Hg.	Gms. $Ca(HS)_2$ per 100 cc. sat. sol. at 0°.	20°.	40°
100....	26.61	24.87	21.97	500....	31.17	28.76	26.61
150....	28.76	25.78	23.47	550....	31.42	29.09	27.02
200....	29.45	26.19	24.24	600....	31.66	29.43	27.35
250....	29.92	26.86	24.79	650....	31.83	29.65	27.69
300....	30.09	27.35	25.20	700....	32.08	30.09	28.04
350....	30.43	27.69	25.50	750....	32.33	30.34	28.35
400....	30.67	28.10	25.94	760....	32.41	30.42	28.44
450....	30.92	28.31	26.25				

From the result at 20° and 760 mm. pressure it was calculated that 206.5 gms. of Ca S are present per liter. The corresponding figure for Ca S in H_2O alone at 20° and 760 mm. pressure of air is 0.212 gms. per liter. Hence H_2S increases the solubility of Ca S in water almost 1000 times.

CALCIUM Benzene SULFONATE $Ca(C_6H_5SO_3)_2H_2O$.

Solubility of Calcium Benzene Sulfonate in Water. (Mameli, 1922.)

t°.	Gms. $Ca(C_6H_5SO_3)_2$ per 100 cc. sat. sol.	t°.	Gms. $Ca(C_6H_5SO_3)_2$ per 100 cc. sat. sol.
0.....	1.766	20.....	1.844
10.....	2.001	30.....	1.211
15.....	1.968	40.....	0.410

According to Ephraim and Pfister 100 cc. sat. sol. in water contain 61.26 gms. $Ca(C_6H_5SO_3)_2$ at 20°. (An explanation of this very wide difference between the two authors is not apparant)

CALCIUM SULFONATES.

Solubility of Several Calcium Sulfonates in Water.

Compound.	Formula.	t°.	Gms. anhydrous cmpd. per 100 cc. sat. sol	per 100 gms. sat. sol.
Calcium anthracene-1-sulfonate...	$Ca(C_{14}H_9SO_3)_2.3H_2O$	20	0.6269	– (1)
» » -2- » ...	$Ca(C_{14}H_9SO_3)_2.H_2O$	20	0.0157	– (1)
» naphthalene-2- » ...	$Ca(C_{10}H_7SO_3)_2.H_2O$	16.5	1.987	– (1)
» » -5-chlor-1- » ...	$Ca(C_{10}H_6SO_3.Cl)_2.1^1/_2H_2O$	20.0	0.373	– (1)
» -2.5.7-naphthylamine di sulfonate..	$Ca(C_{10}H_5NH_2.SO_3)_2$	15	–	40.2 (2)
» -2.6.8- » » ..	$Ca(C_{10}H_5NH_2.SO_3)_2$	15	–	29.1 (2)
» -10-chlorphenanthrene-3 or 6-sulfonate.	$Ca(C_{14}H_8ClSO_3)_2.H_2O$	20	–	0.015 (3)

(1) Ephraim and Pfister, 1925 (a). (2) Braunschweig, 1922–1926. (3) Sandqvist, 1917.

CALCIUM TARTRATES Active $C_4H_4O_6Ca.4H_2O$, Racemic $C_8H_8O_{12}Ca_2.8H_2O$.

Solubility of Active and Racemic Calcium Tartrates in Water.

(Duboux and Cuttat, 1921.)

Results for Active Tartrate.

t°.	Gms. $C_4H_4O_6.Ca$ per 100 gms. sat. sol.	Solid Phase.
0.....	0.0192	$C_4H_4O_6Ca.4H_2O$
12.5...	0.0268	»
25.0...	0.0360	»
37.5...	0.0498	»

Results for Racemic Tartrate.

t°.	Gms. $C_8H_8O_{12}.Ca_2$ per 100 gms. sat. sol.	Solid Phase.
0.....	0.0023	$C_8H_8O_{12}Ca_2.8H_2O$
12.5...	0.0032	»
25.0...	0.0045	»
37.5...	0.0056	»

Saturation was obtained by continuous rotation in a thermostat. The solutions were analyzed by evaporation and determining the calcium in the residue as oxide and as sulfate.

The following determinations by François and Lormand, 1923, were made by employing intermittent agitation during 10 days. The solutions were analyzed by evaporating 500 cc. portions on a water bath and finally in the air, to obtain a residue of a definite degree of hydration. This latter was dried and weighed, and finally converted to sulfate and again weighed. Temperature 20°.

Compound.	Formula.	Solvent.	Gms. hydrated cmpd. per 100 cc. solvent.
Dextro calcium tartrate..	$C_4H_4O_6.Ca.4H_2O$	Water	0.0232
Laevo » ..	»	»	0.0249
Racemic » ..	not given	»	0.00493
Dextro » ..	$C_4H_4O_6.Ca.4H_2O$	32° aq. alcohol	0.0038

CALCIUM Di THIONATE $CaS_2O_6.4H_2O$.

Solubility of Calcium Di Thionate in : (de Baat, 1926.)

Water.

t°.	Gms. CaS_2O_6 per 100 gms. sat. sol.	Solid Phase.
0.....	13.80	$CaS_2O_6.4H_2O$
12.....	17.63	»
20.....	20.25	»
30.....	23.29	»

Aq. ethyl alcohol at 30°.

Gms. per 100 gms. sat. sol. CaS_2O_6.	Gms. per 100 gms. sat. sol. C_2H_5OH.	Solid Phase.
12.55	16.50	$CaS_2O_6.4H_2O$
3.31	40.39	»
1.39	50.96	»
0.11	73.08	»
0.059	92.47	»

CAMPHOR $C_{10}H_{16}O$.

Solubility of Camphor in Water and in Aqueous Solutions.

(Leo and Rimbach, 1919.)

Solvent.	t°.	Gms. $C_{10}H_{16}O$ per 100 gms. sat. sol.
Water..	14-17	0.167 *a*
» ..	15-20	0.170 (Rhode, 1922.)
» ..	39	0.160 *a*

Solvent.	t°.	Gms. $C_{10}H_{16}O$ per 100 gms. sat. sol.
Ringer's solution.....	14-17	0.157 *c*. 0.173 *a* 0.204 *b*
»	35.5	0.140 *c*
»+2% C_2H_5OH.	14-17	0.238 *b*
»+3% » .	14-17	0.270 *b*

a. These determinations were made by shaking with just sufficient excess of active camphor to almost completely dissolve, and also by titrating the saturated solution with 0.1 n $KMnO_4$ solution.

b. In these cases a weighed amount of active camphor was shaken at room temperature with one liter of solvent for 24 hours. The undissolved camphor then filtered off, dissolved in 50 cc. of 95 % C_2H_5OH and from the rotation of the solution, the undissolved camphor was calculated.

c. In these cases 300 cc. of the saturated aqueous solution were extrated with 60 cc. of benzene and the camphor in this determined by the optical method. The determination by Rhode was made by use of a stalogmometric method for estimating the dissolved comphor. (See Norcamphor, next page and Carvone, p. 1159).

EQUILIBRIUM IN THE SYSTEM CAMPHOR, ALCOHOL AND WATER AT SEVERAL TEMPERATURES. (Scheringa, 1922.)

Results at 0°. Gms. per 100 gms. Homogeneous mixture		Results at 15°. Gms. per 100 gms. Homogeneous mixture		Results at 25°. Gms. per 100 gms. Homogeneous mixture.		Results at 40°. Gms. per 100 gms Homogeneous mixture.	
$C_{10}H_{16}O$.	C_2H_5OH.	$C_{10}H_{16}O$.	C_2H_5OH.	$C_{10}H_{16}O$.	C_2H_5OH.	$C_{10}H_{16}O$.	C_2H_5OH.
1.9	36.1	1.6	30.6	1 5	29.2	4.4	30.8
4.8	42.8	4.2	37.7	4.65	36.0	6.2	35.1
10.5	47.2	7.4	42.2	7.0	39.4	16.7	38.9
12.1	48.1	11 1	44.3	10.3	41.3	31.0	38.8
18.3	50.9	19.9	46.5	14.3	42.8	51.3	34.2
21.8	50.9	30.8	46.2	22.0	43.9	59.9	31.5
34.4	49.7	43.8	43.8	29.1	43.6	62.8	30.5
40.3	49.2	51.4	42.1	41.3	41.3	70.5	29.5
48.6	48.5	54.8	41.1	56.1	37.36		
50.9	49.1			61.0	36.5		
				62.8	35.9		
				63.8	36.2		

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given for mixtures of camphor and each of the following systems :

d+*l* Camphene (1)	Camphor + Hydroquinol (2)
d+*l* Camphor (1)	» + *o*, *m* and *p* Nitro phenol (2) (3)
d+*l* Camphoric acid (1)	» + Nitro hydroquinol (3)
d+*r* Camphoric acid (1)	» + 1, 2, 4, Dinitro phenol (2)
d+*l* Camphoric anhydride (1)	» + Picric acid (2)
d+*l* *o* Methyl hydrogen camphorate (1)	» + Pyrocatechol (2)
d+*r* *o* Methyl hydrogen camphorate (1)	» + Nitro pyrocatechol (3)
d+*l* Pinene (1)	» + Pyrogallol (2)
d Camphor + *d* Borneol (1)	» + 2 Nitro Resorcinol (3)
	» + Nitrogen peroxide (4)

(1) Ross and Sommerville, 1926; (2) Kremann and Odelga, 1921; (3) Efremov, 1919; (4) Pascal, 1923.

Nor CAMPHOR $C_9H_{14}O$.

One liter of water dissolves 1.93 gms. Norcamphor at 15-20° (Rhode, 1922). The author used a stalogmometric method involving an estimation of the number of drops per unit of time in the case of a saturated solution and its dilutions, in comparison with similar determinations upon a series of solutions of known content.

Monobenzoyl CAMPHOR.

Data, in the form of diagrams, are given by Vixseboxse, 1921, for the freezing-points and for the solubilities of the enolic and ketonic forms of mono benzoyl camphor in ether (at 15°) acetone, alcohol, toluene and acetic acid, at 17°.

d CAMPHOCARBONIC ACID $C_8H_{14}\begin{cases}CH.COOH\\ |\\ CO\end{cases}$.

SOLUBILITY IN XYLOL AT 20°.1. (Bredig and Joyner, 1918.)

An excess of *d* camphocarbonic acid was shaken in a thermostat at 20°.1 with 25 cc. of xylol for 45 minutes. To 10 cc. of the clear solution 30.4 cc. of 0.5*n* NaOH were added and the mixture shaken 2 minutes, centrifuged 4 minutes and the clear caustic solution layer polarized in a 4 dm. tube. The rotation was 2.28°, corresponding to 0.1827 gm. of the acid per 10 cc. xylol solution. The average of several determinations gave 0.46 gm. $C_8H_{14}\begin{cases}CH.COOH\\ |\\ CO\end{cases}$ per 25 cc. sat. solution in xylol at 20°.1.

SOLUBILITY OF CAMPHO CARBONIC ACID IN XYLOL SOLUTIONS OF SEVERAL COMPOUNDS AT 20°. (Bredig and Joyner, 1918.)

Base added to Xylol.	Gms. base per 25 cc. xylol.	Gms. $C_8H_{15}(CH.COOH)(CO)$ per 25 cc. sat. sol.
Dimethylaniline.	0.2402	0.490
Collidine.....	0.0838	0.706
»	0.2478	1.259
Diethyl amine...	0.0698	0.981
» » ..	0.0768	1.011
» » ..	0.1208	1.301
» » ..	0.1430	0.960
Tribenzyl amine.	0.688	0.515
Diethyl benzyl amine..	0.2214	1.247
Di iso butyl amine...	0.1080	0.934
» » » ...	0.2358	0.624

Base added to Xylol.	Gms. base per 25 cc. xylol.	Gms. $C_8H_{14}(CH.COOH)(CO)$ per 25 cc. sat. sol.
Tripropyl amine.	0.1726	1.214
α Picoline.....	0.1738	0.911
Piperidine.....	0.0354	0.740
»	0.0450	0.732
»	0.0856	1.068
»	0.1766	1.688
Pyridine.....	0.3088	1.30
Quinaldine.....	0.4412	1.035
»	1.122	1.846
Quinoline.	0.2824	0.916
m Toluidine.....	0.7784	1.33

CAMPHORIC ACID $C_8H_{14}(COOH)_2$.

100 gms. glycerol of $d=1.2326$ (= 86.5 %) dissolve 2.36 gms. $C_8H_{14}(COOH)_2$ at 20°.
» » $d=1.2645$ (= 98.6 %) » 4.32 » » »
(Holm, 1921-1922.)

100 gms. Para cymene (b. pt. 176–176°.5) dissolve 1.53 gms. $C_8H_{14}(COOH)_2$ at 100°. (Wheeler, 1920.)

DISTRIBUTION OF CAMPHORIC ACID AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Chloroform.

Millimols. per liter of H_2O layer (C_1).	Millimols. per liter of $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
4.30	0.525	0.116
7.95	1.50	0.189
19.25	10.35	0.538

Water and Xylene.

Millimols. per liter of H_2O layer (C_1).	Millimols. per liter of $C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
3.922	0.0776	0.0198
9.722	0.278	0.0286
19.166	0.834	0.0436

CAMPHYLAMINE $C_9H_{15}CH_2.NH_2$.

DISTRIBUTION BETWEEN WATER AND XYLENE AT 25°. (Smith, 1921-1922.)

Millimols. per liter of H_2O layer (C_1).	Millimols. per liter of $C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.0182	0.982	54.0
0.0396	2.210	55.8
0.0625	3.587	57.9

CAPROIC ACID (Hexoic Acid) $CH_3(CH_2)_4COOH$ (*normal*) and $(CH_3)_2CH.(CH_2)_2COOH$ (*iso*).

DISTRIBUTION OF NORMAL CAPROIC ACID BETWEEN :

Water and Chloroform at 25°. (Smith, 1921-1922.)

Millimols. per liter of H_2O layer (C_1).	Millimols. per liter of $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.0843	0.4281	5.07
0.1158	0.6349	5.49
0.1875	1.1375	6.08
0.2125	1.4375	6.77

Water and Ether at 23°. (Behrens, 1926.)

Concentration in H_2O layer (a).	Concentration in $(C_2H_5)_2O$ layer (b).	$\frac{a}{b}$.
0.00336	0.294	87.5
0.00428	0.380	88 8
0.00439	0.394	89.7
0.00545	0.492	90.3
0.00643	0.595	92.5
0.00978	0.967	98.9

Water and Xylene at 25°. (Smith, 1921-1922.)

Millimols. per liter of H_2O layer (C_1).	Millimols. per liter of $C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.2625	0.5375	2.04
0.3375	0.7375	2.18
0.575	1.50	2.61
0.75	2.15	2.86
0.95	2.95	3.10
2,80	17.7	6.32

DISTRIBUTION OF HEXOIC ACID BETWEEN WATER AND BENZENE AT 25°. (Brown and Bury, 1923.)

Normality of $CH_3(CH_2)_4COOH$ in						
H_2O layer.	0.0078	0.0091	0.0102	0.0114	0.0131	0.0162
C_6H_6 layer.	0.159	0.210	0.256	0.328	0.413	0.619

DISTRIBUTION OF ISO CAPROIC ACID AT 25° BETWEEN : (Smith 1921, 1922.)

Water and Chloroform.

Millimols. per liter of H_2O layer (C_1).	Millimols. per liter of $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$
0.1710	0.755	4.38
0.2175	1.000	4.6
0.2900	1.450	5.0
4.475	2.550	5.7

Water and Xylene.

Millimols. per liter of H_2O layer (C_1).	Millimols. per liter of $C_6H_4(CH_3)_2$ (C_2).	$\frac{C_2}{C_1}$
0.4625	0.7500	1.62
0.8125	1.6375	2.02
1.325	3.375	2.54
1.85	5.6	3.02

CARBAZOLE $(C_6H_4)_2NH$.

100 gms. abs. Alcohol dissolve 1.30 gms. $(C_6H_4)_2NH$ at 20°-25°. (Pucher and Dehn, 1921.)
» Quinoline » 33.40 » »
» Equi molecular Mixture of Alcohol and Quinoline dissolve 9.86 gms. $(C_6H_4)_2NH$ at 20°-25°. (Pucher and Dehn, 1921.)

SOLUBILITY OF CARBAZOLE IN VARIOUS ORGANIC SOLVENTS. (Clark, 1919 *a*.)

Solvent.	*d* of solvent.	B. pt. of solvent.	Gms. $(C_6H_4)_2NH$ per 100 gms. solvent at 15°.5.	30°.	50°.	80°.	100°.
Benzene	0.880	80 – 80.5	0.72	1.01	5.05	–	–
Toluene	0.870	110 – 110.3	0.42	0.78	1.60	2.90	4.78
Refined Solvent Naphtha	0.865	145 – 166	0.48	0.70	1.37	3.00	3.72
Crude »	0.893	152 – 179	0.54	0.94	1.70	3.84	7.00
Heavy Naphtha	0.909	165 – 185	0.48	0.75	1.32	3.63	4.70
Chloroform	1.495	60.4 – 62.0	–	0.60	1.08	–	–
Carbon disulfide	1.270	45.7 – 47.0	–	0.44	–	–	–
Acetone	0.800	56.0 – 57.0	6.12	9.74	62.30	–	–
Light Pyridine (1)	0.952	125 – 150	12.45	16.90	26.74	66.80	–
Heavy Pyridine (1)	1.057	202 – 247	2.72	4.10	10.57	16.54	22.87
Hydrated Pyridine (2).	1.050	94 – 96	0.42	0.81	1.90	4.70	–
Carbon Tetra chloride	1.610	75.5 – 76.5	0.09	0.11	0.30	–	–
Gasoline	0.742	90 – 164	0.11	0.12	0.16	–	–
Ether	0.720	35 – 40.2	2.54	2.90	–	–	–

(1) These are the bases derived from coal tar oils by abstraction with H_2SO_4 and liberation of the base with caustic soda. They probably contain but very little pyridine.
(2) $= C_5H_5N.3H_2O$.

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given for mixtures of carbazole and each of the following compounds :

Chrysene (Pascal, 1921.)
Retene »
Phenanthrene »
Hydroquinol (Kremann and Slovak, 1920.)
α and β Naphthol »
Pyrogallol »
Pyrocatechol »
Picric acid »
o, *m* and *p* Nitrophenol (Kremann and Slovak, 1920.)
1, 2, 4 Dinitro phenol (Kremann and Slovak, 1920.)
Resorcinol (Kremann and Slovak, 1920.)
1, 2, 4 Dinitro toluene (Kremann and Strzelba, 1921.)
1, 2, 4, 6 Trinitro toluene (Kremann and Strzelba, 1921; Rheinboldt, Henning and Kircheisen, 1925.)
Quinone (Kremann, Sutter, Sitte, Strzelba and Dobotsky, 1922.)

Trimethyl CARBINOL $(CH_3)_3C.OH$.

Freezing-point data are given for mixtures of trimethyl carbinol and the following compounds :

Hydroquinol (Kremann and Wlk, 1919.)
α and β Naphthol »
α and β Naphthylamine (Kremann and Wlk, 1919.)
o and *m* Phenylene diamine (Kremann and Wlk, 1919.)
Pyrogallol (Kremann and Wlk, 1919.
Pyrocatechol (Kremann and Wlk, 1919.)
Resorcinol »
p Toluidine »
o, *m* and *p* Nitrophenol, 1, 2, 4 Dinitro phenol, Naphthalene (Kremann, Mauermann, Müller II, and Rösler, 1922-23.)

Freezing-point lowering data are given for mixtures of triphenyl carbinol and each of the following compounds:

Hydroquinol (Kremann and Wlk, 1919.)
α and β Naphthol »
α and β Naphthylamine »
Phenol »
Pyrocatechol »
Resorcinol »
p Toluidine »
o, *m* and *p* nitrophenol, Picric acid, *m* and *p* phenylene diamine (Kremann, Hohl and Muller II, 1921.)

Pyrogallol, 1.2.4 –Dinitro toluene, 1.2.4.6–Trinitro toluene (Kremann, Hohl and Muller II, 1921.)

Triphenyl methane, 1.1.4–Dinitro phenol, Naphthalene (Kremann, Mauermann, Mulle II and Rösler, 1923.)

Quinone, » + *p* nitro phenol (Kremann, Sutter Sitte, Strzelba and Dobotsky, 1922.)

Solubility of Methylic, Ethylic and of Propylic Ether Oxides of Phenyl Ethinyldiphenyl Carbinols in Several Solvents.

(Moureu, Dufraisse and Blatt, 1924.)

	Gms. per 100 gms. sat. solution.					
Solvent.	t°.	Cmpd. A.	t°.	Cmpd. B.	t°.	Cmpd. C.
Methyl alcohol	15.8	0.2	15.9	2.7	16.2	4.7
Ethyl »	15.8	0.2	15.9	3.4	16.2	4.8
Propyl »	15.9	0.5	15.9	7.0	16 2	9.9
Petroleum ether (b. pt. 50-60°)	16.0	0.9	16.0	27.3	16.0	62.5

Cmpd. A = $C_6H_5.C \equiv C.C.(C_6H_5)_2.OCH_3$;
Cmpd. B = $C_6H_5.C \equiv C.C.(C_6H_5)_2.OC_2H_5$;
Cmpd. C = $C_6H_5.C \equiv C.C.(C_6H_5)_2.OC_3H_7$ (normal).

CARBON DIOXIDE CO_2.

Solubility of Carbon Dioxide in Water at Low Concentrations.

(Buch, 1925.)

Cc. CO_2 per 10 liters of the gas phase.	Absorption Coef. of CO_2.	Cc. CO_2 per 10 liters of the gas phase.	Absorption Coef. of CO_2.
1.07	0 156	11.4	0.102
2.0	0.150	12.3	0.096
2.7	0.110	12 8	0.0985
3.6	0.097	19.5	0.090
8.43	0.095	50.4	0.093

Solubility of Carbon Dioxide in Water and in Organic Solvents.

(Kunerth, 1922.)

	Cc. CO_2 dissolved per 1 cc. of solvent at								
Solvent.	18°.	20°.	22°.	24°.	26°.	28°.	30°.	32°.	34°.	36°.
Water	–	0.900	0.872	0.834	0.800	0.765	0.729	0.693	0.656	–
Acetone	–	6.98	6.76	6.55	6.22	5.88	5.49	5.08	4.66	–
Acetic acid	5.40	5.23	5.07	4.91	4.73	4.57	4.41	4.25	4.12	4.00
Pyridine	3.95	3.85	3.75	3.63	3.53	3.45	3.33	3.25	3.13	3.03
Methyl alcohol	3.63	3.57	3.51	3.44	3.37	3.28	3.19	3.09	2.97	–
Ethyl »	2.95	2.87	2.80	2.73	2.66	2.58	2.48	2.41	2.31	–
Benzaldehyde	3.06	2.98	2.90	2.80	2.73	2.66	2.58	2.52	2.46	2.39
Aniline	–	1.38	1.35	1.32	1.29	1.25	1.22	1.21	1.19	1.17
Amyl acetate	4.79	4.65	4.55	4.44	4.35	4.29	4.14	4.10	4.02	–
Ethylene bromide	2.32	2.27	2.22	2.16	2.12	2.07	2.03	1,97	1.92	1.86
Iso amyl alcohol	–	1.91	1.88	1.85	1.81	1.76	1.72	1.69	1.67	–
Chloroform	3.83	3.71	3.60	3.50	3.39	3.26	3.11	2.94	2.81	2.68

The CO_2 and solvent were measured at the same temperature and barometric pressure. The CO_2 was saturated with the vapor of the solvent before the solubility determination was made and thus no allowance for the vapor pressure of the solvent was necessary. The CO_2 was prepared by heating $NaHCO_3$ and passing the gas over $CaCl_2$ to remove H_2O.

Solubility of Carbon Dioxide in Water at High Pressures.

(Haehnel, 1920.)

Water was saturated with carbon dioxide in an autoclave of about 1.5 liters capacity. The autoclave was shaken frequently during six hours. Of the saturated solution thus obtained, 75 to 100 cc. were removed and brought to atmospheric pressure, and the excess of CO_2 which was given off was measured in a eudiometer.

Pressure in atmospheres.	Vol. of CO_2 (at 0° and 760 mm.) dissolved by 1 vol. of H_2O at			Gms. CO_2 per 100 gms. of the sat. solution at		
	0°.	12.43°.	15°.	0°.	12.43°.	15°.
1.....	1.80	1.09	1.00	0.35	0.21	0.20
5.....	8.71	5.15	4.59	1.71	1.01	0.90
10.....	15.89	9.65	8.39	3.12	1.90	1.65
15.....	21.82	13.63	11.85	4.28	2.68	2.33
20.....	26.53	17.11	15.21	5.21	3.36	2.99
25.....	30.46	20.34	17.64	5.98	3.99	3.47
30.....	33.65	23.25	20.31	6.61	4.57	3.99
35.....	36.73	–	22.52	7.21	–	4.42
38.....	37.87	–	–	7.44	–	–
40.....	–	–	24.44	–	–	4.79
45.....	–	–	25.59	–	–	5.03
50.....	–	–	27.06	–	–	5.31
52.....	–	–	27.67	–	–	5.44

The results at 12.°43 are those of v. Wroblewski (*Ann. phys. chem.*, 18, 290, 1883). The results at 1 atmosphere pressure are taken from Bunsen.

Data for the supersaturation of water and other solvents with carbon dioxide, hydrogen, oxygen, nitrogen and air are given by Metschl, 1924.

Solubility of Carbon Dioxide in Aqueous Solutions of Prussian Blue.

(Gatterer, 1926.)

For details in regard to the preparation of the prussian blue solutions, etc., see Gatterer's results for acetylene, p. 1016.

Normality of Prussian Blue solution.	Solubility l of CO_2 at				
	25°.	20°.	15°.	10°.	5°.
0.896.....	0.8421	0.9512	1.087	1.255	1.453
0.51.....	0.8505	0.9613	1.093	1.264	1.464
0.37.....	0.8577	0.9684	1.106	1.277	1.478
0.178.....	0.853	0.9633	1.098	1.268	1.472
0.126.....	0.8443	0.9549	1.089	1.258	1.465

Solubility of Carbon Dioxide in Aqueous Solutions of Ferric Hydroxide.

(Gatterer, 1926.)

For details of the experiments see Gatterer's results for acetylene, p. 1016.

Normality of Ferric hydroxide solution.	Solubility l of CO_2 at				
	25°.	20°.	15°.	10°.	5°.
0.000 (=H_2O).	0.856	0.936	1.050	1.240	1.446
0.071.....	0.8533	0.9610	1.095	1.267	1.471
0.144.....	0.8764	0.9870	1.123	1.297	1.503
0.293.....	0.9063	1.016	1.154	1.326	1.534
0.513.....	0.9526	1.066	1.204	1.379	1.584
0.967.....	1.032	1.149	1.291	1.470	1.680

The results for H_2O are the mean of the author's determinations. They agree well with the results of Bohr and Bock and of Geffcken.

In studying the effect of CHLOROPHYLL upon the solubility of carbon dioxide, Kremann and Schinderschitsch, 1916, found the solubility coefficient in 95 % alcohol to be $l_{16} = 2.44$, 2.48 and 2.53. The corresponding figure for a 95 % alcoholic solution of chlorophyll was $l_{16} = 2.37$ (in the light) and 2.44 (in the dark). These values all agree with the data of Winkler and show no appreciable effect on the solubility of CO_2, resulting from the presence of chlorophyll.

Data for the solubility of CO_2 in blood and in plasma, quoted from Bohr, are given by O'Brien and Parker, 1922.

100 cc. of RUBBER saturated with carbon dioxide at 21°, dissolve 99 cc. CO_2 (0° and 760 mm.). The determination was made by pumping out the gas with a Töpler pump and measuring it over mercury. Results for the effect of pressure and temperature upon the solubility are also given. (Venable and Fuwa, 1922.)

EQUILIBRIUM IN THE SYSTEM CARBON DIOXIDE AND ETHER.

(Thiel and Schulte, 1920.)

t°.	Mol. per cent Ether in the Vapor Phase.	Liquid Phase.
—78.6.....	0.065	52.6
—63.7.....	0.25	72.9
—23.8.....	6.1	93.3
± 0.....	23.8	97.7
+15.....	45.4	98.6

Solubility of Solid CO_2 in Ether.

t°.	Mol. per cent in sat sol. Ether.	CO_2.
—83.5.....	54.6	45.4
—92.5.....	63.4	36.6
—98.0.....	69.4	30.6

The authors also give results for the composition of the vapor phase and in some cases, the liquid phase, in systems composed of carbon dioxide and each of the following compounds : ethyl chloride, sulfur dioxide, methyl ether, chlorine and hydrogen sulfide.

CARBON DISULFIDE CS_2.

EQUILIBRIUM IN THE SYSTEM CARBON DISULFIDE, ETHYL ALCOHOL AND WATER.

(Schoorl and Regenbogen, 1922 *a*.)

Mixtures of known volumes of the three highly purified constituents were cooled to the appearance of milkiness, and the temperature determined by means of a thermometer immersed in the mixture. Open tubes were used in some cases and closed tubes in others. The determinations were plotted and the following values read from the curves.

Ratio in cc. of H_2O.	to C_2H_5OH.	Cc. of CS_2 per 100 cc. of $H_2O + C_2H_5OH$ mixture to cause clouding at 0°.	10°.	15°.	20°.	40°.	60°.	80°.
66.7	33.3	—	0.4	—	—	—	—	—
50.0	50.0	1.0	1.5	1.75	2.0	2.4	3.3	4.7
33.3	66.7	3.7	4.7	5.2	5.6	—	—	—
25.0	75.0	7.0	9.0	9.5	10.0	—	—	—
17.0	83.0	12.0	13.8	14.7	15.6	—	—	—

Ratio in cc. of CS_2.	to C_2H_5OH.	Cc. of H_2O per 100 cc. of $CS_2 + C_2H_5OH$ mixture to cause clouding at 0°.	10°.	15°.	20°.	40°.	60°.	80°.
17.0	83.0	12	14	15	16	—	—	—
25.0	75.0	6	7.8	8.7	9.6	—	—	—
37.0	63.0	2.5	3.6	4.1	4.7	—	—	—
50.0	50.0	1.0	1.65	2.0	2.45	4.5	6.5	9.0
67.0	33.0	0.55	0.95	1.1	1.3	—	—	—
75.0	25.0	0.4	0.65	0.75	0.9	—	—	—

Ratio in cc. of H_2O.	to CS_2.	Cc. C_2H_5OH per 100 cc. of $H_2O + CS_2$ mixture to cause clouding at 0°.	10°.	15°.	20°.	40°.	60°.	80°.
50.0	50.0	—	—	—	—	66.5	63.0	59.0

100 gms. sat. sol. of carbon disulfide in 92.0 wt. % C_2H_5OH contain 34.6 gms. CS_2 at 15°. (Ormandy and Craven, 1921.)

Reciprocal Solubility of Carbon Disulfide and Ethyl Alcohol.

(Schoorl and Regenbogen, 1922a.)

t° of clouding.	Cc. CS_2 per 100 cc. of mixture.
—62.0	98.0
—42.0	94.3
—35.0	90.9
—24.0	77.8
—24.0 (crit. temp.)	71.5
—24.0	57.0
—45.0 (about)	43.0
—75.0 (less than)	29.0

(Mc Kelvy and Simpson, 1922.)

t° of clouding.	Gms. CS_2 per 100 gms. mixture.	t° of clouding.	Gms. CS_2 per 100 gms. mixture.
—108.04	99.09	— 24.31	82.71
— 73.68	98.55	— 25.13	76.25
— 43.71	96.78	— 26.88	70.39
— 30.16	93.05	— 35.17	61.23
— 25.76	89.57	— 54.58	49.46
— 25.07	87.48	— 79.26	38.75
— 24.4 (crit. t.)	83.0	—100.07	31.96

The determinations of Mc Kelvy and Simpson were made with exceptional car .

Reciprocal Solubility of Carbon Disulfide and Methyl Alcohol.

(Mc Kelvy and Simpson, 1922.)

t° of clouding.	Gms. CS_2 per 100 gms. mixture.	t°. of clouding.	Gms. CS_2 per 100 gms. mixture.	t° of clouding.	Gms. CS^0 per 100 gms. mixture.
—18.85	99.64	34.82	88.43	30.70	64.12
+ 6.46	98.47	35.7 (crit. t.)	85.0	28.60	61.03
26.50	95.27	35.75	84.73	27.34	60.53
28.0	94.74	35.63	83.89	13.80	49.93
30.58	93.55	35.30	77.65	— 4.43	41.29
31.08	93.00	34.09	72.85	— 38.37	28.78
33.80	90.22	33.35	70.13	— 73.60	18.70
				—100.7 (f. pt.)	6.39

100 gms. anhydrous formic acid dissolve 4.66 gms. CS_2 at 25°. (Gordon and Reid, 1922.)

CARBON MONOXIDE CO.

Solubility of Pure Carbon Monoxide in Serum and in Plasma.

(O'Brien and Parker, 1922.)

t°.	Cc. of CO absorbed per 1.0 cc. of Beef serum.	Sheep serum.	Human serum.	Beef plasma.
15	0.203	0.0206	—	0.0198
20	0.181	0.0187	0.0180	0.0181
25	0.161	0.0156	0.0183	0.0169
30	0.145	0.0153	0.0158	0.0147
37	0.129	0.0144	0.0142	0.0134

As a check upon the above determinations the authors also determined the solubility of carbon monoxide in water and obtained results in good agreement with those of Winkler. (See « Solubilities », p. 235.)

100 cc. of rubber saturated with carbon monoxide at 21°, dissolve 6.2 cc. CO (at 0° and 760 mm.). The determination was made by pumping out the gas with a Töpler pump and measuring it over mercury. Results for the effect of temperature and pressure upon the solubility are also given. (Venable and Fuwa, 1922.)

CARBON OXYSULFIDE COS.

1 cc. H_2O dissolves 0.54 cc. COS at 20° (Stock and Kusz, 1917.)
1 cc. alcohol » 8.0 cc. COS at 22° »
1 cc. toluene » 15.0 cc. COS at 22° »

CARBON TETRACHLORIDE CCl_4.

Solubility of Carbon Tetrachloride at 20° in Aqueous 50 per cent Ethyl Alcohol Saturated with Various Salts. (Wright, 1926.)

Salt present.	None.	NaCl.	$NaNO_3$.	KCl.	KNO_3.	KBr
Gms. CCl_4 per 100 gms. solvent	6.4	13.4	8.2	9.9	7.1	9.9

Solubility of Carbon Tetrachloride in Liquid Sulfur Dioxide.

(Bond and Beach, 1926.)

The synthetic method was used and special precautions were taken to prevent contact with moisture.

t°.	Gms. CCl_4 per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. CCl_4 per 100 gms. sat. sol.	Solid Phase.
−26.76	98.77	CCl_4	−29.27 (Crit. sol.t.)	58.19	(liquid layer)
−30.58	97.81	»	−29 68	49.93	»
−34.90	97.44	»	−35.2	31.66	»
−44.63	95.43	»	−37.2	28.36	»
−39.80	88.44	(liquid layer)	−47.2	16.44	SO_2
−34.9	82.56	»	−47.5	15.31	»
−33.57	80.83	»	−50.9	13.33	»
−29.8	66.26	»	−57.9	8.42	»
−29.37	58.98	»	−66.1	5.24	»

100 gms. anhydrous formic acid dissolve 6.95 gms. CCl_4 at 25°. (Gordon and Reid, 1922.)

Freezing-point lowering data are given for mixtures of:

Carbon tetra chloride + Chlorine (Biltz and Meinecke, 1923.).
» » + Ethylene dibromide (Linard, 1925.)
» » + Nitrogen peroxide (Pascal, 1923.)

CARBONYL CHLORIDE $COCl_2$.

Solubility of Carbonyl Chloride in Several Solvents.

(Atkinson, Heycock and Pope, 1920.)

Two or three cc. quantities of the several solvents were saturated by passing a stream of carbonyl chloride through them while they were kept in a constant temperature bath untill no further absorption occurred. About 3 hours were required. The bulb was then sealed and weighed. The quantity of carbonyl chloride was then determined by breaking the bulb in a closed bottle containing 50 or 100 cc. of standard Na OH solution and titrating back with acid.

Solvent.	t°.	Gms. $COCl_2$ per 100 gms. solvent.	Solvent.	t°.	Gms. $COCl_2$ per 100 gms. solvent.
Toluene	17	244.7	Chloro benzene	12 3	442.1
»	23.5	124.2	»	16.6	204.3
»	30.5	79.38	»	16.7	221.6
»	31.5	74.48	»	24.2	99.9
Xylene	12.3	457.3	»	29.7	81.7
»	16.4	225.6	Petroleum (b.pt.180°-280°)	12.3	263.8
»	16.9	217.9	»	15.8	163.1
»	23.8	103.4	»	16.7	143.4
»	29.8	71.24	»	22.4	79.5
Creosote oil	16.2	77.42	»	23.7	71.2
Acetylene tetra chloride	16.8	149.7	»	29.9	49.2
» »	25.1	89.4	»	30.0	48.6
» »	29 9	74.9	Heavy lubricating oil	15.6	79.7
Nitro benzene	16.8	106.4	»	23.5	39.3
α Chloro naphthalene	17.0	104.5	»	31.0	24.5

CARBOTHIOCYANINE COMPOUNDS.

Solubility of Each in Methyl Alcohol at 25°.

(Mills and Braunholtz, 1922.)

Compound.	Gms. cmpd. per 100 gms. sat. sol.
Methyl diethyl thiocyanine iodide (A)	0 240
Diethyl thiocyanine iodide (B)	0.123
Mixture of A and B	0.373

These determinations were made for the purpose of establishing the identity of the first of the above two compounds.

CARVONE $C_{10}H_{14}O$, CARVENONE $C_{10}H_{16}O$, etc.

SOLUBILITY OF EACH COMPOUND SEPARATELY IN WATER AT 15-20°.
(Rhode, 1922.)

The determinations were made by a stalogmometric method in which the number of drops per unit of time in the case of saturated solutions and their dilutions were compared with the number of drops per unit of time found for solutions of known content. For obtaining saturation long periods of shaking were often necessary. The attainment of saturation was controlled by stalogmometric measurements.

Compound.	Formula.	Millimols. per liter of sat. sol.
Carvone	$CH_3.C\begin{matrix}\diagup\!\!\diagup CH.CH_2 \\ \diagdown CO.CH_2\end{matrix}\!\!>CH.C(CH_2).CH_3$	8.8
Carvenone	$CH_3.CH\begin{matrix}\diagup CO.CH \\ \diagdown CH_2.CH_2\end{matrix}\!\!>C.CH(CH_3)_2$	14.5
Dihydro carvone	$CH_3.CH\begin{matrix}\diagup CO.CH_2 \\ \diagdown CH_2.CH_2\end{matrix}\!\!>CH.C(CH_3)_2.CH_2$	6.8
Tetrahydro carvone	$CH_3.CH\begin{matrix}\diagup CO.CH_2 \\ \diagdown CH_2.CH_2\end{matrix}\!\!>CH.CH(CH_3)_2$	3.9
Carvotanazetone	$C_{10}H_{16}O$	5.8

CARVOXIME $C_{10}H_{14}$:NOH *d* and *l*.

Freezing-point data for mixtures of *d* and *l* carvoxime are given by Rheinboldt and Kircheisen, 1926.

CARYOPHYLLIN $C_{30}H_{48}O_3$.

APPROXIMATE SOLUBILITY IN SEVERAL SOLVENTS. (Dodge, 1918.)

Solvent.	t°.	Gms. $C_{30}H_{48}O_3$ per 100 gms. solvent.	Solvent.	t°.	Gms. $C_{30}H_{48}O_3$ per 100 gms. solvent.
95 % alcohol	20	0.943	Ether	20	1.538
95 % alcohol	b. pt.	2.857	Chloroform	20	0.847
Acetone	20	0.555	Methyl alcohol	20	0.425

CASEIN

SOLUBILITY OF CASEIN IN DILUTE SOLUTIONS OF SODIUM CHLORIDE AT 18-22°.
(Ryd, 1917.)

An accurately weighed amount of highly purified casein was dissolved in an accurately measured amount of CO_2 free Na OH solution, in an apparatus provid ed with an efficient stirrer and into which measured amounts of standard Na OH and HCl solutions could be introduced from burets. Provision was made to prevent the introduction of CO_2. An amount of H Cl equivalent to the Na OH present was added. If too much casein was present the opalescence and precipitation occurred before the neutral point was reached. If, on the other hand, too little casein was present more acid could be added than corresponded to the used amount of Na OH without causing opalescence. By alternate additions of Na OH and H Cl the point could finally be obtained where the last added drop of HCl just produced opalescence. A series of such determinations gave the following results :

Mols NaCl. per liter.	Gms. Casein per liter.	Mols NaCl per liter.	Gms. Casein per liter.	Mols. NaCl per liter.	Gms. Casein per liter.
0.03653	0.64	0.11140	3.46	0.16054	1.87
0.06900	1.43	0.12308	3.37	0.17476	1.65
0.07944	1.86	0 12645	3.11	0.18525	1.55
0.09222	2.48	0.13111	2.97	0.20227	1.50
0.09250	2 68	0.13619	2.82	0.22839	1.40
0.10189	2.87	0.14688	2.52	0.23395	1.39
0.10643	3.24	0.15676	2.09	0.27245	1.32

The p_H of the solutions varied between 5.05 and 5.52.

Solubility of Casein in Aqueous Solutions of Salts and Acids.

(von Euler and Bucht, 1923.)

An excess of casein was shaken with 50 cc. portions of the aqueous solutions for 2 or 4 hours. The temperature is not stated. The dissolved casein was determined by the addition of sodium acetate or acetic acid and filtering the precipitate and drying in a vacum over H_2SO_4, and then in an ordinary desiccator over solid Na OH.

Solvent.	Concentration of solvent in mols per liter.	Gms. Casein dissolved per 50 cc.	Solvent.	Concentration of solvent in mols per liter.	Gms. Casein dissolved per 50 cc.
Aq. sodium tartrate..	0.005	0.0236	Aq. chlor. acetic ac..	0.005	0.0523
» ..	0.010	0.0264	» ..	0.010	0.1399
» ..	0.020	0.0731	» ..	0.020	0.700
» ..	0.100	0.2544	» ..	0 050	1.0+
Aq. tartaric acid....	0.0045	0.0480	50 % Aq. C_2H_5OH sol.		
»	0.009	0.0943	of chlor acetic acid..	0.002	0.0033
»	0.018	0.1608	» ..	0.005	0.0444
»	0.026	0.2173	» ..	0.010	0.0682
»	0.046	0.3363	» ..	0.020	0.0894

Results are also given for the solubility of casein in chlor acetic acid solutions in aqueous 42.6 % and 58.6 % C_2H_5OH. In these cases the amount of chlor acetic adsorbed by the undissolved casein was also determined. Similar experiments were also made with solutions of α brom propionic acid in aqueous 42.6 % C_2H_5OH, and a series of determinations was made with 0.1 normal monochlor acetic acid in 42.6 % aqueous C_2H_5OH to which increasing amounts of casein were added.

100 gms. abs. alcohol dissolve 0.28 gm. casein at 20-25° (Pucher and Dehn, 1921.)
» quinoline » 0.38 » » » »
» equi molecular mixture of alcohol and quinoline dissolve 0.92 gms. casein at 20-25°.

CATECHOL (Pyro catechol), *o* $C_6H_4(OH)_2$.

Solubility in Aqueous Solutions of Hydrochloric Acid at 25°.

(Knox and Richards, 1919.)

Normality		Normality	
HCl.	$C_6H_4(OH)_2$.	HCl.	$C_6H_4(OH)_2$.
0.0	4.19	7.30	0.62
1.68	2.13	9.11	0.55
3.53	1.18	10.83	0.55
5.39	0.81		

CELLOBIOSE Octa ACETATE $C_{12}H_{14}O_{11}(CH_3COO)_8$.

Distribution Between Chloroform and Aqueous Solutions of Calcium Thiocyanate.

(Herzog and Bergenthun, 1923.)

Ten cubic centimeter portions of chloroform and of aqueous calcium thiocyanate were shaken 12 hours (at room temp.,?) with the quantities of cellobios octa acetate shown. The acetate present in 5 cc. portions of the chloroform before and after the period of shaking, was determined by evaporation and weighing the residue.

Results for aqueous $Ca(SCN)_2$ solutions of

9.08 Normality		8.68 Normality		7.90 Normality	
Gms. Acetate used per 10 cc.	Distribution coef.	Gms. Acetate used per 10 cc.	Distribution coef.	Gms. Acetate used per 10 cc.	Distribution coef.
0.0478	3.20	0.0525	0.58	0.0525	0.03
0.0966	3.86	0.1018	0.56	0.1018	0.06
0.1912	3.61	0.2000	0.56	0.2000	0.04
0.3314	3.38	0.3506	0.56	0.3506	0.05
0.4700	3.33	0.4762	0.57	0.4762	0.04

Solubility of Cellulose Esters in Various Organic Solvents.

(Mardles, 1928.)

"Cellulose esters dissolve in numerous organic liquids to form clear, viscous, colloidal solutions, from which the ester can be recovered unchanged. Some liquids appear to be better solvents than others, dissolving the cellulose acetate more rapidly and yielding less viscous solutions. Similarly a mixture of liquids often forms a better solvent than either taken singly." Saturation cannot be obtained in the ordinary way on account of the rapid rise of viscosity with concentration. The author has chosen a method based upon the observation of Schützenberger (*Compt. rend.*, 68, 814, 1869) that the triacetate of cellulose dissolves in nitrobenzene on warming and precipitates in a gelatinous form on cooling the solution. "The method of observing this transition temperature of the dispersion medium, from a complete solvent to a partial or non-solvent, has been used to appraise the relative solvent powers of liquids for cellulose esters. The point of precipitation is marked by the appearance of turbidity or opalescence, as in the case when a mixture of liquids is cooled below the temperature of complete miscibility, indicating the transition from a true solution to a coarse dispersion." About 5 cc. of a solution of a concentration of 5 grams per 100 cc., contained in a test-tube, was cooled with stirring, and the temperature noted at which opalescence appeared.

Results for Cellulose Acetate (Rhone).

Solvent.	t° of opalescence for a concentration of 5 gm. per 100 cc.
Benzyl alcohol	25°
»	35
Cyclo hexanol	95
o Methyl cyclo hexanol	109
p Methyl cyclo hexanol	115
m Methyl cyclo hexanol	123
Cyclohexanone	−17
Cresyl acetate	42
Phenyl acetate	33
Tolyl alcohols	47

Results for $(C_{12}H_{13}O_8Cl_3)_x$, believed to be Cellulose Chlor Acetate.

Solvent.	t° of opalescence. for a concentration of 5 gm. per 100 cc.
Amyl benzoate	90°
Benzyl alcohol	57
Tolyl alcohols	75
Methyl butyrate	less than −65
Tolyl ethyl ethers	110
Cresyl methyl ethers	125
Tolyl methyl ethers	70
Amyl acetate	−60
Diacetone alcohol	27

Cellulose nitroacetate in benzyl alcohol (5 gm. per 100 cc.) gives opalescence at 25° and at higher temperatures, depending upon the nitrogen content of the sample.

The author found that for very dilute solutions the temperature of opalescence rises with concentration, but eventually remain nearly constant over a wide range of concentration, and then falls with further increase.

Data for the solubility in binary and ternary systems of solvents are also given.

An indirect method of determining the solubility consists in comparing the effect upon various solvents of the addition of different amounts of an indifferent miscible non-solvent, such as petroleum ether, upon the temperature of precipitation of the cellulose ester. The non solvent, which was usually the heptane fraction of petroleum spirit, was added from a buret to about 5 cc. of the solution (of 5 gms. per 100 cc.) contained in a test-tube kept at 20°, untill the incipient turbidity persists. An extensive series of such measurements is given.

CEROUS CHLORIDE $CeCl_3$.

100 gms. pyridine dissolve 1.58 gms. $CeCl_3$ at 0°. (Müller, R., 1924.)

CEROUS ELAIDATE, PALMITATE and STEARATE.

Solubilities in Ether and in Turpentine. (Morrell, 1918.)

Compound.	Formula.	Solvent.	t°.	Gms. cmpd. per 100 gms. sat. sol.
Cerous Elaidate.....	$Ce(C_{18}H_{33}O_2)_3$	Ether	cold	1.07
» Palmitate....	$Ce(C_{16}H_{31}O_2)_3$	Ether	»	0.8
» »	»	Turpentine	»	0.18
» Stearate.....	$Ce(C_{18}H_{35}O_2)_3$	Ether	»	0.6

CERIUM Ammonium SULFATES.

Equilibrium in the System Cerium Sulfate, Ammonium Sulfate and Water at 0°. (Zambonini and Restaino, 1926.)

The saturated solutions and the solid phases were analyzed.

Gms. per 100 gms. sat. sol. $(NH_4)_2SO_4$.	Gms. per 100 gms. sat. sol. $Ce_2(SO_4)_3$.	Solid Phase.	Gms per 100 gms. sat. sol. $(NH_4)_2SO_4$.	Gms per 100 gms. sat. sol. $Ce_2(SO_4)_3$.	Solid Phase.
0.71	8.66	$Ce_2(SO_4)_3.8H_2O$+1.1.8	28.47	0.73	1.5
0.97	5.63	» »	29.19	0.61	»
1.02	3.64	» »	31.59	0.36	»
6.28	0.89	1.1.8	35.73	–	»
12.91	0.79	»	40.06	–	»
18.38	0.81	»	41.00	–	»
25.35	0.83	»	42.17	–	»
28.62	0.87	»+1.5	43.69	–	»+$(NH_4)SO_4$

1.1.8 = $Ce_2(SO_4)_3.(NH_4)_2SO_4.8H_2O$; 1.5 = $Ce_2(SO_4)_3.5(NH_4)_2SO_4$.

CERIUM Potassium SULFATES.

Equilibrium in the System Cerium Sulfate, Potassium Sulfate and Water at 25°. (Zambonini and Restaino, 1926 *a*.)

Gms. per 100 gms. sat. sol. K_2SO_4.	Gms. per 100 gms. sat. sol. $Ce_2(SO_4)_3$.	Solid Phase.	Gms. per 100 gms. sat. sol. K_2SO_4.	Gms. per 100 gms. sat. sol. $Ce_2(SO_4)_3$.	Solid Phase.
0.02	7.95	1.1.2	1.43	0.05	1.4 1/2
0.04	6.66	»	1.77	0.00	»
0.07	4.88	»	2.87	0.00	»
0.12	3.48	»	4.65	0.00	»
0.16	1.74	»+2.3.8	5.56	0.00	1.5
0.79	0.30	2.3.8	6.22	0.00	»
1.26	0.12	»+1.4 1/2	7.72	0.00	»
1.13	0.15	» »	9.22	0.00	»
1.17	0.13	» »	9.66–9.80	0.00	»+K_2SO_4

1.1.2 = $Ce_2(SO_4)_3.K_2SO_4.2H_2O$; 2.3.8 = $2Ce_2(SO_4)_3.3K_2SO_4.8H_2O$; 1.4 1/2 = $Ce_2(SO_4)_3.4\,1/2\,K_2SO_4$; 1.5 = $Ce_2(SO_4)_3.5K_2SO_4$.

CERIUM Thallium SULFATES.

Equilibrium in the System Cerium Sulfate, Thallium Sulfate and Water at 25°. (Zambonini and Restaino, 1926 *a*.)

Gms. per 100 gms. sat. sol. Tl_2SO_4.	Gms. per 100 gms. sat. sol. $Ce_2(SO_4)_3$.	Solid Phase.	Gms. per 100 gms. sat. sol. Tl_2SO_4.	Gms. per 100 gms. sat. sol. $Ce_2(SO_4)_3$.	Solid Phase.
1.01	1.02	1.1.4	2.52	0.14	1.3.1
1.14	0.65	»	2.44	0.16	»+1.4 1/2
1.23	0.54	»	2.55	0.12	» »
1.80	0.32	»	3.46	0.05	1.4 1/2
1.90	0.33	»	5.33	0.00	»
2.35	0.24	»+1.3.1	5.21	0.00	
2.29	0.18	» »	5.45	0.00	
2.44	0.17	» »			

1.1.4 = $Ce_2(SO_4)_3.Tl_2SO_4.4H_2O$; 1.3.1 = $Ce_2(SO_4).3Tl_2SO_4.H_2O$; 1.4 1/2 = $Ce_2(SO_4)_3.4\,1/2\,Tl_2SO_4$.

CETENE (Hexadecane) $C_{16}H_{34}$.

Mutual Solubility of Cetene and Liquid Sulfur Dioxide.
(Seyer and Hugget, 1924.)

The cetene was prepared from spermaceti (cetyl palmitate) by destructive distillation at 300°, and purified by fractional vacuum distillation. The fraction having a melting-point close to that of cetene was redistilled 8 times. The bulb method was used for the determination of the freezing-points and the solubility.

t° of complete miscibility.	Gms. $C_{16}H_{34}$ per 100 gms. mixture.	t° of complete miscibility.	Gms. $C_{16}H_{34}$ per 100 gms. mixture.
— 2.2 (f. pt.)	100.00	42.5	44.73
+ 9.5	79.23	42.7 (crit. t.)	35.13
20.5	69.16	42.6	17.40
28.1	61.90	32.1	6.64
34.8	53.42	24.0	3.97
—38.4	50.19	72.7 (m. pt. SO_2)	0.00

CETYL ALCOHOL $C_{16}H_{33}OH$.

Solubility of Cetyl Alcohol in Liquid Sulfur Dioxide.
(Seyer and Ball, 1925.)

The bulb method was used. The temperatures were determined at which a small crystal of the alcohol just failed to dissolve and at which it just disappeared. The average of the two temperatures was taken as the temperature of solubility.

t° of Solubility.	Gms. $C_{16}H_{33}OH$ in 100 gms. mixture.	t° of Solubility.	Gms. $C_{16}H_{33}OH$ per 100 gms. mixture.
48.0 (m. pt.)	100.0	23.5	31.18
41.6	95.85	23.8	28.34
30.9	69.00	22.7	11.20
27.8	66.27	22.7	10.40
25.5	57.46	22.2	7.70
24.8	46.39	5.3	0.42
23.9	34.87		

Freezing-point lowering data for mixtures of *n* cetyl alcohol and diphenyl amine are given by Giua and Cherchi, 1919.

CETYL PALMITATE and STEARATE.

Solubility of Each in Several Solvents. (Whitby, 1926.)

Compound.	Formula.	Solvent.	t°.	Gms. cmpd. per 100 gms. solvent.
Cetyl palmitate	$C_{16}H_{33}C_{15}H_{31}COO$	Ether (abs.)	0	2.30
» »	»	» »	22	21.01
» »	»	Alcohol (abs.)	22	0.0495
» »	»	Acetic acid (glacial)	22	0.0633
» stearate	$C_{16}H_{33}C_{17}H_{35}COO$	Ether (abs.)	0	0.73
» »	»	» »	22	9.08
» »	»	Alcohol (abs.)	22	0.0594
» »	»	Acetic acid (glacial)	22	0.0388

CHELIDONIC ACID $C_7H_4O_6.H_2O$.

100 gms. sat. sol. of chelidonic acid in water contain 1.45 gms. $C_7H_4O_6$ at 25°. (Verkade, 1924.)

100 gms. sat. sol. of chelidonic acid in 0.5 molar aq. H_3BO_3 sol. contain 1.51 gms. $C_7H_4O_6$ at 25°. (Verkade, 1924).

CHLORAL HYDRATE $CCl_3.CH(OH)_2$.

100 gms. abs. alcohol dissolve 215.0 gms. $CCl_3.CH(OH)_2$ at 20-25°. } (Pucher and Dehn, 1921.)
» quinoline » 12.56 » » » »

100 gms. equi molecular mixture of alcohol and quinoline dissolve 0.58 gms. $CCl_3.CH(OH)_2$ at 20-25°.

SOLUBILITY OF CHLORAL HYDRATE IN WATER, ETHYL ALCOHOL, CHLOROFORM AND IN TOLUENE. (Speyers, 1902.)

See note in connection with Acenaphthene, p. 1001.

	In Water		In Alcohol		In Chloroform		In Toluene	
t°.	W.	S.	W.	S.	W.	S.	W.	S.
0...	1.433	239	1.11	188	1.530	3.8	0.848	3.25
5...	1.460	292	1.16	200	1.515	4.1	0.900	5.5
10...	1.485	375	1.23	220	1.510	5.2	0.910	8.0
15...	1.510	495	1.30	310	1.505	8.0	0.915	13.0
20...	1.535	660	1.36	425	1.510	15.5	0.94	21.0
25...	1.555	825	1.42	610	1.520	33.0	0.97	31.0
30...	1.580	1005	1.49	950	1.540	65.0 (27°.7)	1.02	50.0
35...	1.590	1210	1.55	1590	1.570	–	1.13	77.0
40...	1.605	1430	1.60	2780	1.590	∞	1.40	124.0
45...	1.620	–	–	5600	–	–	–	200.0

W = Wt. in gms. of 1 cc. sat. sol.; S = Gms. $CCl_3.CH(OH)_2$ per 100 gms. solvent.

CHLORINE Cl_2.

SOLUBILITY IN AQUEOUS SOLUTIONS OF SODIUM CHLORIDE AND OF HYDROCHLORIC ACID. (Oliveri-Mandala, 1920.)

The manner in which the results are reported is not perfectly clear. The solubility of chlorine in water is stated as 6.745 and 6.760 per cent Cl. These figures are evidently grams per liter and not grams per 100 grams sat. solution. Also in the case of the results for the aqueous sodium chloride solutions, the results for chlorine are stated to be in terms of gm. mols per liter when it is evident that they are really gms. per liter. Correcting these apparant errors, the results are as follows.

Results for aqueous solutions of Sodium Chloride at 20° and 762 mm. pressure.

Gm. mols. per liter	
NaCl.	Cl_2.
0.000	0.0953
0.777	0.0705
1.323	0.0594
1.965	0.0496
3.159	0.0373
3.597	0.0321

Results for aqueous solutions of Hydrochloric Acid at 20° and 760.5 mm. pressure.

Gm. mols. per liter	
HCl.	Cl_2.
0.00	0.0965
1.155	0.1010
1.872	0.1049
2.500	0.1092
3.000	0.1139
4.101	0.1243

Data for the solubility of chlorine in water, with reference to the hydrolysis which occurs, are given by Arkadiev, 1918.

SOLUBILITY OF CHLORINE IN SEVERAL SOLVENTS. (Taylor and Hildebrand, 1923.)

Chlorine was bubbled slowly through the solvent untill equilibrium was reached and the dissolved chlorine was determined by titration. Time 1 1/2 hrs.

Solvent.	t°.	Partial pressure of Cl_2 in Mm.	Gms. Cl_2 per 1.0 gm. sat. sol.	Mol. per cent Cl_2. In experiment.	Mol. per cent Cl_2. At 1 atm. p.p.
Heptane	0	750	0.2036	26.5	27.0
Silicon tetrachloride ($SiCl_4$)	0	681	0.131	26.6	28.8
Carbon tetrachloride (CCl_4)	0	729	0.156	28.6	29.8
» »	19	680	0.0848	16.3	18.7
» »	40	557	0.0433	8.91	12.15
Ethylene dibromide ($C_2H_4Br_2$)	20	752	0.0813	19.0	19.2
» »	40	736	0.0469	11.51	11.9

Freezing-point lowering data are given for mixtures of chlorine and each of the following compounds :

Acetone, Carbon tetrachloride, Chloroform, Ethyl alcohol, Ethyl acetate, Ethyl ether, Methyl alcohol, Toluene — (Waentig and McIntosh, 1915.)

Tin tetrachloride (Waentig and McIntosh, 1915.)
» » (Biltz and Meinecke, 1923.)
Silicon » » » »
Titanium » » » »
Etylene oxide (Maass and Boomer, 1922.)
Nitrosyl chloride (Trautz and Gerwig, 1925.)
Tellurium (Damiens, 1923.)

CHLOROFORM $CHCl_3$.

Equilibrium in the System Chloroform, Ethyl Alcohol and Water.

(Schoorl and Regenbogen, 1922.)

Mixtures of accurately measured volumes of the very carefully purified constituents were cooled to the appearance of milkiness and the temperature measured by a thermometer immersed in the mixture. The determinations were plotted and the following results for regular intervals of temperature obtained from the curves.

Ratio in cc. of H_2O	to C_2H_5OH.	Cc. $CHCl_3$ required to yield clouding at 0°.	10°.	15°.	20°.	25°.	66°.
80	20	–	0.7	–	–	–	–
66.7	33.3	0.7	1.0	1.3	1.6	1.9	–
60	40	1.5	2.2	2.5	2.9	3.2	–
50	50	6.35	7.6	8.2	8.9	9.6	14.0
33.3	66.7	20.8	22.9	23.9	24.9	25.9	–

Ratio in cc. of $CHCl_3$	to C_2H_5OH.	Cc. H_2O required to yield clouding at 0°.	10°.	15°.	20°.	25°.	66°.
33.3	66.7	20.1	22.3	23.4	24.4	25.5	–
50.0	50.0	8.8	9.7	10.2	10.6	11.1	14.5
69.0	31.0	3.4	3.65	3.8	3.95	4.15	–
81.0	19.0	1.4	1.5	1.6	1.65	1.7	–

For a mixture of 50 cc. of H_2O + 50 cc. $CHCl_3$, 45 cc. C_2H_5OH are required to yield clouding at 66°.

It is pointed out that the difference between the present results and those of Bancroft are easily explained if Bancroft used alcohol containing 6 % H_2O, instead of absolute.

Freezing-Points of Mixtures of Chloroform and Ethyl Ether.

(Smits and Berckmans, 1918.)

t° of freezing.	Mols $CHCl_3$ per 100 mols. mixture.	Solid Phase.	t° of freezing.	Mols $CHCl_3$ per 100 mols. mixture.	Solid Phase.
–66.5.....	100.0	$CHCl_3$	– 95.8.....	45.13	$CHCl_3.(C_2H_5)_2O$
–72.6.....	90.04	»	– 99.7.....	40.00	»
–78.7.....	81.77	»	–104.8.....	35.00	»
–93.5.....	70.00	»	–108.1.....	33.33	»
–95.2 (Eutec.).	–	» + $2CHCl_3.(C_2H_5)_2O$	–111.4.....	30.05	$CHCl_3.2(C_2H_5)_2O$
–93.6.....	68.00	$2CHCl_3.(C_2H_5)_2O$	–114.3.....	27.0	»
–93.5.....	66.66	»	–117.6.....	20.0	»
–93.6.....	65.00	»	–118.4.....	18.65	»
–96.0.....	61.00	»	–121.5.....	14.99	»
–97.4 (Eutec.).	–	» + $CHCl_3.(C_2H_5)_2O$	–121.7 (Eutec.).	–	» + $(C_2H_5)_2O$
–96.4.....	60.0	$CHCl_3.(C_2H_5)_2O$	–119.9.....	10.01	
–95.1.....	55.0	»	–118.3.....	5.13	»
–94.4.....	50.0	»	–116.4.....	0.00	»

Freezing-point data for mixtures of chloroform and nitrogen peroxide are given by Pascal, 1923.

CHLOROPICRIN (Trichloronitromethane) CCl_3NO_2.

Reciprocal Solubility of Chloropicrin and Water. (Thompson and Black, 1920.)

Chloropicrin was shaken with a large amount of water to form an emulsion. The mixture was allowed to stand 3 days at room temperature and then maintained at 25° for 6 hours. The chlorine in 100 cc. of the solution was determined. A similar experiment was made at 0°. For the 75° result the solution sat. at 0° waw kept 2 days in a thermostat at 75°.

t°	0°.	25°.	75°.
Gms. CCl_3NO_2 per 100 cc. H_2O	0.2272	0.1621	0.1141

For the determination of the solubility of water in chloropicrin, a small amount of water was dissolved in a large amount of chloropicrin and the mixture slowly cooled untill a white cloud appeared. The temperature was then slowly raised untill clearing occurred. The average of the temperature of clouding and of clearing was taken as the temperature of solubility.

t°	32°.	36°.	41°.	48°.	50°.8.	55°.
Gms. H_2O per 100 gms. CCl_3NO_2.	0.1003	0.1185	0.1243	0.1647	0.1853	0.2265

Freezing-point data for mixtures of chloropicrin and nitrogen peroxide are given by Pascal, 1923.

CHOLESTEROL–DIGITONIDE.

Solubility in Water and in Ethyl Ether. (Mueller, 1917.)

The compound was prepared by precipitating recrystallized cholesterol, made from gall stones, by digitonin, filtering, washing-throughly with alcohol and ether and drying. Some of the resulting compound was shaken with ether for 24 hours at room temperature. After filtering, exactly 100 cc. were evaporated in several portions from a small weighed porcelain dish, the residue was dried at 110° and weighed. The average of 3 determinations gave :

0.0007 gm. Cholesterol–Digitonide per 100 cc. of ether.

Similar determinations, using boiling water as the solvent, gave :

0.0006 gm. Cholesterol–Digitonide per 100 cc. of H_2O.

CHROMI–HEXAMINE SALTS $[Cr(NH_3)_6]X_3$.

Solubility of Each in Water at 17°.5. (Ephraim and Mosimann, 1922.)

On account of the rapidity of decomposition of the salts, the saturated solutions were prepared by shaking for a period of not more than two hours.

Salt.	Formula.	Per 1000 cc. sat. sol. Gms. Cr.	Gm. mols. salt.
Chromi–Hexamine Chloride	$[Cr(NH_3)_6]Cl_3$	21.9	0.42
» Bromide	$[Cr(NH_3)_6]Br_3$	6.12	0.118
» Iodide	$[Cr(NH_3)_6]I_3$	2.25	0 043
» Nitrate	$[Cr(NH_3)_6][NO_3]_3$	3.74	0.072
» Bichromate	$[Cr(NH_3)_6][Cr_2O_7]_3$	0.26	0.005
» Sulfate	$[Cr(NH_3)_6]_2[SO_4]_3$	2.43	0.046
» Phosphate	$[Cr(NH_3)_6]_2[PO_4]_3$	0.1676	0.0032
» Oxalate	$[Cr(NH_3)_6]_2[C_2O_4]_3$	0.0876	0.00084
» Picrate	$[Cr(NH_3)_6][O.C_6H_2(NO_2)_3]_3$	0.0190	0.00037
» (Naphtalene β Sulfonate)	$[Cr(NH_3)_6][C_{10}H_7SO_3]_3$	0.0352	0.00069
» Chlorate	$[Cr(NH_3)_6][ClO_3]_3$	3.25	0.062
» Perchlorate	$[Cr(NH_3)_6][ClO_4]_3$	1.03	0.0199

CHROMIUM CHLORIDES $CrCl_2.6H_2O$, Violet salt and Green salt.

Data for the change in the critical solution temperature of systems composed of water and butyric acid, water and isobutyric acid, etc., caused by the addition of various amounts of violet chromium chloride and green chromium chloride, are given by Howard and Patterson, 1926.

CHROMIUM HELIANTHATE $Cr(C_{14}H_{14}N_3SO_3)_3.6H_2O$.

1000 cc. H_2O dissolve 0.176 gms. of the hydrated salt (= 0.15 gm. helianthine) at 20–25°.

(Stark and Dehn, 1918.)

CHROMIUM HYDROXIDE $Cr_2O_3.9H_2O$.

Solubility of Chromium Hydroxide in Aqueous Solutions of Sodium Hydroxide at Room Temperature.

(Erich Müller. 1924; Fricke and Windhausen, 1924.)

Müller gives data for the effect upon the equilibrium, of time, temperature, concentration of sodium hydroxide and amount of chromium hydroxide present. The results show that chromium hydroxide is a solid solution in which simple and polymeric molecules are present in homogeneous mixture.

The following results by Fricke and Windhausen give a curve, the ascending branch of which (up to concentrations of 10 normal Na OH) corresponds to the formation of mono sodium chromite. Analyses of the solid phase for the descending curve corresponded to $Cr_2O_3.3Na_2O.8H_2O$ + retained Na OH.

Normality of Na OH.	Gms. Cr_2O_3 per 100 cc. sat. sol.	Normality of Na OH.	Gms. Cr_2O_3 per 100 cc. sat. sol.	Normality of Na OH.	Gms. Cr_2O_3 per 100 cc. sat. sol.
0.9	0.25	8.56	2.52	12.01	1.51
1.71	0.5	9.89	2.89	13.26	1.09
3.65	1.10	10.00	2.68	14.15	0.80
5.10	1.58	10.20	2.48	15.60	0.40
7.25	2.09	11.06	1.90	17.42	*

* Almost colorless solution.

Three days were allowed for equilibrium. Experiments are also given for chromium hydroxide which had been altered by contact with concentrated K OH for increasing lengths of time.

CHROMIUM TRIOXIDE CrO_3.

Solubility of Chromium Trioxide in Aqueous Solutions of Nitric Acid at 25° and 45°. (Mumford and Gilbert, 1923.)

Results at 25°.

$d_{\frac{25}{4}}$ of sat. sol.	Gms. per 100 gms. sat. sol. HNO_3.	Gms. per 100 gms. sat. sol. CrO_3.
1.704	0.0	62.85
1.684	2.28	60.31
1.661	5.95	56.57
1.640	9.37	52.51
1.606	13.25	48.10
1.570	19.30	41.97
1.528	26.79	34.32
1.481	35 35	25.54
1.434	46.91	14.63
1.402	59.11	4.88
1.409	68.49	0.95
1.440	74.47	0.27
1.456	82.90	0.06
1.466	86.56	0.10
1.475	89.17	0.18
1.503	92.63	1.89
1.557	91.36	8.29

Results at 45°.

$d_{\frac{25}{4}}$ of sat. sol.	Gms. per 100 gms. sat. sol. HNO_3.	Gms. per 100 gms. sat. sol. CrO_3.
1.695	0.0	63.51
1.676	2.05	61.27
1.654	5.58	57.93
1.619	11.47	51.71
1.569	19.53	43.41
1.490	33.29	29.57
1.409	50.69	13.15
1.384	65.74	2.47
1.416	73.81	0.88
1.450	81.55	0.44
1.481	88.35	0.60
1.512	91.83	3.39
1.581	88.06	9.42

The solid phase was CrO_3 in all cases.

EQUILIBRIUM IN THE SYSTEM CHROMIUM TRIOXIDE, SULFUR TRIOXIDE AND WATER.
(Gilbert, Buckley and Masson, 1922.)

The mixtures were rotated in sealed tubes in a thermostat. Equilibrium was approached from above and from below. The solid phases were determined by direct analysis and by the « rest method ».

RESULTS AT 25°.

$d_{\frac{25}{4}}$ of sat. sol.	Mol. per cent SO_3.	Mol. per cent CrO_3.	Solid Phase.	$d_{\frac{25}{4}}$ of sat. sol.	Mol. per cent SO_3.	Mol. per cent CrO_3.	Solid Phase.
–	0.0	25.73	CrO_3	1.786	32.64	1.62	CrO_3
1.669	1.55	20.69	»	1.788	33.17	1.58	$CrO_3.SO_3$
1.626	3.34	17.41	»	1.803	33.14	1.02	»
1.579	5.73	13.20	»	1.806	34.29	0.97	»
1.520	7.51	9.70	»	1.799	35.41	0.80	»
1.496	9.99	6.13	»	1.801	36.14	0.54	»
1.460	12.61	3.38	»	1.818	38.11	0 71	»
1.479	15.89	1.17	»	1.837	38.81	1.12	»
1.580	22.15	0.14	»	1.814	37.79	0.43	»
1.610	23.22	0.11	»	1.812	38.69	0.50	»
1.680	26.43	0.23	»	1.823	38.97	0.36	»
1.690	27.56	0.28	»	–	45.80	0.44	$CrO_3.SO_3.H_2O$*
1.690	28.17	0.28	»	1.834	47.01	0.20	»
1.728	29.35	0.55	»	1.841	51.78	0.14	»
1.756	31.42	0.97	»	1.915	57.50	0.40	»
1.771	31.93	1.23	»	–	58.94	0.88	»

RESULTS AT 45°.

$d_{\frac{45}{4}}$ of sat. sol.	Mol. percent SO_3.	Mol. percent CrO_3.	Solid Phase.	$d_{\frac{45}{4}}$ of sat. sol.	Mol. percent SO_3.	Mol. percent CrO_3.	Solid Phase.
–	5.25	13.79	CrO_3	–	35.40	1.06	$CrO.SO_3$
–	16.73	1.00	»	–	37.07	0.63	»
–	22.01	0.17	»	1.797	38.10	0.60	»
1.751	31.05	1.16	»	1.814	42.26	0.38	»
–	33.55	1.15	$CrO.SO_3$	–	45.67	0.30	$CrO.SO_3.H_2O$*

* The composition of this solid phase was not determined with certainty.

SOLUBILITY OF CHROMIUM TRIOXIDE IN SULFURIC ACID AT 23°.
(Meyer and Stateczny, 1922.)

Per cent H_2SO_4.	d_{23} of H_2SO_4.	d_{23} of sat. sol. of CrO_3 in H_2SO_4.	Concentration *.	Per cent CrO_3.
20.4	1.139	1.510	49.19	29.25
39.6	1.296	1.511	21.55	14.23
60.7	1.501	1.516	1.53	1.01
75.8	1.672	1.680	0.82	0.49
79.6	1.717	1.730	1.37	0.79
84.9	1.772	1.788	1.65	0.92
85.1	1.774	1.796	2.22	1.24
90.3	1.814	1.832	1.88	1.03
92.5	1.820	1.822	0.20	0.11
97.2	1.832	1.840	0.84	0.46
97.6	1.833	1.840	0.78	0.42
99.9	1.831	1.835	0.43	0.23
99.95	1.830	1.833	0.30	0.16
100.00	1.829	1.831	0.15	0.076

* No explanation is given by the authors of the terms implied by this heading.

Solubility of Chromium Trioxide in Selenic Acid at 23°.
(Meyer and Stateczny, 1922.)

Per cent H_2SeO_4.	d_{23} of H_2SeO_4.	d_{23} of sat. sol. of CrO_3 in H_2SeO_4.	Concentration*.	Per cent. CrO_3.
55.1	1.581	1.730	14.95	8.65
81.2	2.142	2.145	0.35	0.16
87.9	2.325	2.330	0.67	0.29
96.2	2.525	2.253	0.43	0.17
98.5	2.590	2.599	0.90	0.35

* No explanation is given by the authors of the terms implied by this heading.

Data for the freezing-points of mixtures of CrO_3 and H_2SO_4 are given by Meyer and Stateczny, 1922.

CHRYSENE $C_{18}H_{12}$.

Freezing-point data for mixtures of chrysene and phenanthrene are given by Pascal, 1921.

CINEOLE (Eucalyptol) $C_{10}H_{18}O$.

Solubility of Cineole in Water. (Earle, 1918.)

t°	1°.5.	7°.5.	10°.0.	21°0.	40°.0.	50°.0.
Gms. $C_{10}H_{18}O$ per 100 gms. H_2O.	0.64	0.57	0.54	0.35	0.21	0.19

CINCHONIDINE $C_{19}H_{22}N_2O$.

Solubility in Water at 15°. (Kolthoff, 1925.)

In determining the solubility product it was found that 5 cc. of a 0.0086 normal cinchonidine sulfate solution + 1.2 cc. 0.01 normal Na OH just yielded a few crystals. The $p_H = 7.6$ and $p_{OH} = 6.6$, corresponding to $[OH'] = 2.5.10^{-7}$. $L_{Cinchonidine} = 1.38.10^{-9}$. The calculated solubility in water is 9.10^{-4} mols. or 0.265 gm. per liter.

A saturated solution of cinchonidine sulfate in water was found to have a concentration of 0.0324 normal or 1.286 gm. $(C_{19}H_{22}N_2O)_2.H_2SO_4.6\,H_2O$ per liter at 15°.

CINCHONIDINE HELIANTHATE $C_{19}H_{22}N_2O(C_{14}H_{15}N_3SO_3)$.

1000 cc. H_2O dissolve 0.196 gm. of the salt at 20-25°. (Stark and Dehn, 1918.)

CINCHONINE $C_{19}H_{22}N_2O$.

Solubility in Water at 15°. (Kolthoff, 1925.)

In determining the solubility product it was found that 5.0 cc. of a 0.00975 molecular cinchonine sulfate solution + 0.2 cc. of 0.01 normal Na OH gave a precipitate only after long standing. With 0.3 cc. or 0.4 cc. of 0.01 *n* Na OH the precipitate appeared immediately. All the solutions had a p_H of 6.0 or a p_{OH} of 8.2, corresponding to $[OH'] = 6.4.10^{-9}$. The calculated solubility product, $L_{Chinchonine} = 6.10^{-11}$. Calculating from this and the first dissociation constant $K_1 = 1.4.10^{-6}$, the solubility of cinchonine in water is $4.8.10^{-6}$ mols. or 0.0144 gm. per liter.

A saturated solution of **Cinchonine Sulfate** in water was found to have a concentration of 0.039 normal or 1.41 gm. $(C_{19}H_{22}N_2O)_2.H_2SO_4.2\,H_2O$ per liter at 18°. The saturated solution had a p_H of 5.8 and first dissociation constant $_1K_1 = 1.4.10^{-6}$ and second dissociation constant $K_2 = 1.2.10^{-10}$.

CINNAMIC ACID $C_6H_5CH{:}CH.COOH$.

100 gms. H_2O dissolve 0.0546 gm. $C_9H_8O_2$ (= 0.003686 gm. mol. per liter) at 25°. (Meyer, 1911.)

Solubility of Cinnamic Acid in Aqueous Solutions of Hydrochloric Acid at 25°. (Knox and Richards, 1919.)

Equivalent normality		Equivalent normality	
HCl.	$C_9H_8O_2$.	HCl.	$C_9H_8O_2$.
0.00	0.00385	8.007	0.00400
2.100	0.00283	10.29	0.00556
4.174	0.00272	10.47	0.00572
6.250	0.00318		

I liter of sat. sol. of cinnamic acid in water contains 0.00334 gm. mol. $C_9H_8O_2$ at 25°.
in 0.025 *n* Na fumarate sol. contains 0.00938 gm. mol. $C_9H_8O_2$ at 25°.
in 0.050 *n* » 0.01260 » (Larsson, 1926.)

Solubility of Cinnamic Acid in Several Solvents.

Solvent.	t°.	Gms. $C_9H_8O_2$ per 100 gms. solvent.	Authority.
Absolute ethyl alcohol	20–25	22.03	(Pucher and Dehn, 1921.
Quinoline	»	1.85	»
Equi mol. mixture of alcohol and quinoline	»	132.40	»
Dichlor acetylene (cis) (b. pt. 60°.2)	0	2.32	(Lebrun. 1925.)
» » (trans.) (b. pt 48°.3)	0	1.93	»
Bromobutene (b. pt. 93°.9)	40	4.65	»
» (b. pt. 85°.5-85°.6)	40	3.68	»
Crotonic nitrile (b. pt. 107°.7–108°.2)	30	10.27	»
» » (b pt. 121°.8–122°.2)	30	9.72	»
Ethyl chlor isocrotonate	20	4 38	»
Cocoanut oil	25	1.77	(Verkade, 1921.)
Cotton seed oil	25	1.44	»
Castor oil	25	7.52	»
Linseed oil	25	1.66	»
Olive oil	25	1.29	»
Peanut oil I	25	1.62	»
» II	25	1.42	»

Distribution of Cinnamic Acid Between Water and Xylene at 25°.
(Smith, 1921–1922.)

Millimols. $C_9H_8O_2$ per liter of		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	
0.160	0.465	2.90
0.225	1.025	4.55
0.295	2.215	7.45

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given for mixtures of cinnamic acid and each of the following compounds :

α and β Naphthylamine	(Kremann, Weber and Zechner, 1925.)	
o, *m* and *p* Phenylene diamine	»	»
p Toluidine	»	»
Urea	»	»
Phenol	(Kremann, Zechner and Drâzil, 1924.)	
Picric acid	»	»
Pyrogallol	»	»
α and β Naphthol	»	»
o, *m* and *p* Nitro phenol	»	»
1, 2, 4 Dinitro phenol	»	»
Hydroquinol	»	»
Pyrocatechol	»	»
Resorcinol	»	»

Hydro CINNAMIC ACID $C_6H_5CH_2.CH_2COOH$.

Distribution of Hydrocinnamic Acid at 25° Between : (Smith, 1921-1922.)

Water and Chloroform.			Water and Xylene.		
Millimols. $C_9H_{10}O_2$ per liter of		$\frac{C_2}{C_1}$.	Millimols. $C_9H_{10}O_2$ per liter of		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$CHCl_3$ layer (C_2).		H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	
0.089	0.650	7.30	0.375	0.975	2.60
0.1058	0.835	7.90	0.575	1.775	3.09
0.134	1.190	8.87	0.85	3.40	4.00
0 177	1.770	10.00	1.15	5.00	4.35

CINNAMIC ALDEHYDE $C_6H_5.CH:CH.CHO$.

Freezing-point lowering data for mixtures of cinnamic aldehyde and each of the following compounds are given by Kremann and Zechner, 1925.

α and β Naphtol	Pyrocatechol
o, *m*, *p* Nitro phenol	Resorcinol

SOLUBILITY OF SEVERAL ALKYL CINNAMIC ACIDS IN BENZENE AND IN PETROLEUM ETHER. (Stoermer, Grimm and Laage, 1917.)

Compound.	Formula.	M. pt.	t°.	Gms. cmpd. per 100 gms. Benzene.	Gms. cmpd. per 100 gms. Petroleum ether.
β Methyl cinnamic acid (stable)	$C_6H_5.C(CH_3):CH.COOH$	98.5	21	19.2	2.08
» » (unstable)	»	131.5	21	7.8	0.89
» » (mixed form)	»	76.0	21	42.2	5.2
β Ethyl cinnamic acid (stable)	$C_6H_5.C(C_2H_5):CH.COOH$	95.5	20	44.5	1.7
» » (unstable)	»	93.5	20	21.5	0.68
» » (mixed)	»	62–63	20	122.0	6.2
β Propyl cinnamic acid (stable)	$C_6H_5.C(C_3H_7):CH.COOH$	94	18	14.6	1.5
» » (unstable)	»	86.5	22	58.0	4.5 (18°)
» » (mixed)	»	59–60	23	88.5	9.8 (21°)
o Methoxy β Methyl cinnamic acid (stable)	$(2)CH_3O.C_6H_4.C(CH_3):CHCOOH$	96.5	21	10.0	1.1
» » (unstable)	»	123.4	21	8.2	0.1
» » (mixed)	»	76–78	21	33.2	2.25
p β Dimethyl cinnamic acid (stable)	$CH_3(4)C_6H_4C(CH_3):CHCOOH$	135	20	2.6	0.12
» » (unstable)	»	117.5–118	20	11.8	0.55
» » (mixed)	»	94–96	20	18.2	1.8

CITRACONIC ACID (Methyl Maleic Acid) $CH_3C.(COOH):HC.COOH$.

SOLUBILITY OF CITRACONIC ACID IN SEVERAL SOLVENTS. (Lebrun, 1925.)

Solvent.	t°.	Gms. $C_5H_6O_4$ per 100 gms. solvent.
Crotonic nitrile (b. pt. 107°.7–108°.2)	30	30.52
» (b. pt. 121°.8–122°.2)	30	25.93
Dichlor acetylene (cis) (b. pt. 60°.2)	40	0.63
» (trans) (b. pt. 48°.3)	40	0.47

CITRIC ACID $(CH_2)_2COH(COOH)_3.H_2O$.

SOLUBILITY OF CITRIC ACID IN WATER, DETERMINED BY THE FREEZING-POINT METHOD. (Kremann and Eitel, 1923.)

t° of crystallization.	Gms. $(CH_2)_2COH(COOH)_3$ per 100 gms. sat. sol.	Solid Phase.	t° of crystallization.	Gms. $(CH_2)_2COH(COOH)_3$ per 100 gms. sat. sol.	Solid Phase.
— 0.9	7.95	Ice	—11.30	45.71	Ice
— 1.67	12.59	»	—11.8 (Eutectic)	46.47	»+$(CH_2)_2COH(COOH)_3.H_2O$
— 1.60	13.81	»	—12.63	47.35	Ice (unstable)
— 2.40	18.53	»	—12.81	48.14	»
— 3.00	21.37	»	—10.20	—	$(CH_2)_2COH(COOH)_3.H_2O$
— 3.78	25.46	»	— 8.5	49.93	»
— 4.87	29.26	»	— 3.0	54.30	»
5.40	32.05	»	+ 1.6	56.31	»
— 6.3	34.93	»	1.2	56.56	»
— 7.91	38.54	»	0.0	56.77	»
8.00	39.89	»	10.8	58.78	»
8.73	41.50	»	10.0	59.30	»
—10.45	43.83	»	15.0	59.06	»

Freezing-point data are also given for the ternary mixture citric acid + sugar + water.

SOLUBILITY OF CITRIC ACID IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°. (Knox and Richards, 1919.)

Equivalent Normality. HCl.	Equivalent Normality. $C_6H_8O_7$.	Equivalent Normality. HCl.	Equivalent Normality. $C_6H_8O_7$.	Equivalent Normality. HCl.	Equivalent Normality. $C_6H_8O_7$.
0.0	12.54	3.795	7.36	9.635	3.46
0.949	11.03	5.718	5.38	10.36	3.35
2.189	9.30	7.736	4.09	11.09	3.29

SOLUBILITY OF CITRIC ACID IN AQUEOUS SOLUTIONS OF SULFURIC ACID AT 25°
(Knox and Richards, 1919.)

Equivalent Normality.		Equivalent Normality.		Equivalent Normality.	
H_2SO_4.	$C_6H_8O_7$.	H_2SO_4.	$C_6H_8O_7$.	H_2SO_4.	$C_6H_8O_7$.
1.689	10.57	10.83	3.28	18 18	1.76
4.206	7.97	11.46	3.07	20.59	2.00
7.145	5.61	14.24	2.23	22.37	2.88

100 gms para cymene (b. pt. 176°-176°.5) dissolve 0.034 gm. citric acid at 25°.
(Wheeler, 1920.)

COBALT (and Other Metal) AMMONIUM COMPOUNDS.

In connection with an exhaustive study of the theory of the solubility of salts and of the application of thermodynamic functions to solutions, Brönsted and his associates (1919-1926) have published an extensive series of determinations of the solubility of metal ammonium compounds in water and in various salt solutions. These results are of especial importance in connection with the principles they are intended to elucidate, but on account of the complex character of the compounds and the restricted conditions of the experiments, the results are believed not to be of sufficient general interest to be quoted completely in the present compilation of quantitative solubility data. With few exceptions the determinations are published in easily accessible journals and can readily be found by those especially interested in this group of compounds. In the present case only such of the results as refer to water as the solvent will be quoted. Fortunately, the most of these are given in a single paper by Brönsted and Petersen, 1921. The data for the solubility in aqueous salt solutions will be found in the other papers listed under Brönsted's name in the authors index.

In general, saturation was obtained by agitating the highly purified compounds repeatedly with fresh portions of water untill a constant solubility was found. On account of the high velocity of solution of metal ammonium compounds, relatively short periods of time were required for saturation. This permitted determinations for several of the salts which are transformed slowly in aqueous solution. In the most recent experiments, saturated solutions were prepared by percolating a column of the solid 10-12 cm. in height with solvent flowing at a rate of about 1.5 liters per 24 hours. The first portions of the percolate were discarded. Relatively large volumes of saturated solution were used for analysis. The analytical method consisted in adding an excess of fixed alkali and estimating the liberated ammonia by absorption in 0.05 normal H_2SO_4, using methyl red as indicator.

SOLUBILITY OF CROCEO COBALTIC NITRATE IN WATER.
(Brönsted, 1919, 1922.)

This salt exists in two modifications. The more stable of these is the β modification. It is a light brown crystal powder while the α modification consists of citrine needle shaped crystals. Both varieties have one molecule of water of crystallization.

	Gms. mols. $[Co(NO_2)_2(NH_3)_4]NO_3$ per liter sat. sol.		
t°.	α Modification.	β Modification.	Solid Phase in both cases.
0.....	0.00546	0.00501	$[Co(NO_2)_2(NH_3)_4]NO_3.H_2O$
5.02...	–	0.00645	»
10.06...	–	0.00821	»
15.07...	–	0.01040	»
20.00...	0.01483	0.01306	»

Data are also given for the solubility of the two forms of this compound in a large number of aqueous salt solutions.

Solubility of Cobalt (and Other Metal) Ammonium Compounds in Water.

(Brönsted and Petersen, 1921.)

Compound.	Formula.	Gm. mols. cmpd. per 1000 cc. sat. sol. at 0°.	20°.
Cesium tetranitro-diammine cobaltiate	$Cs[Co(NH_3)_2(NO_2)_4]$	0.00531	0.01720
Cesium tetrathio cyanato-diammine chromiate	$Cs[Cr(NH_3)_2(SCN)_4]$	0.00079	0.00258
Potassium tetranitro-diammine cobaltiate	$K[Co(NH_3)_2(NO_2)_4]$	0.0240	–
Silver » » »	$Ag[Co(NH_3)_2(NO_2)_4]$	0.000772	0.00210
» oxalo-dinitro » »	$Ag[Co(NH_3)_2(NO_2)_2C_2O_4]$	0.00278	0.00822
Thallous tetranitro » »	$Tl[Co(NH_3)_2(NO_2)_4]$	0.00251	0.00789
» oxalo-dinitro » »	$Tl[Co(NH_3)_2(NO_2)_2C_2O_4]$	0.00420	0.00977
$(CH_3)_4N$ tetranitro » »	$(CH_3)_4N[Co(NH_3)_2(NO_2)_4]$	0.00749	0.0197
Carbanato-tetrammine-cobaltic tetrathiocyanato cobaltic sulfate	$[Co(NH_3)_4CO_3][Co(SCN)_4SO_4]$	–	0.070
Carbanato-tetrammine-cobaltic tetrathiocyanato cobaltic chromiate	$[Co(NH_3)_4CO_3][Co(SCN)_4CrO_4]$	0.00185	0.00555
Carbanato-tetrammine-cobaltic tetranitro-diammine cobaltiate	$[Co(NH_3)_4CO_3][Co(NH_3)_2(NO_2)_4]$	0.00366	0.0124
Croceo (1) bromide	$[Co(NH_3)_4(NO_2)_2]Br$	0.012	–
» chloride	$[Co(NH_3)_4(NO_2)_2]Cl$	0.0222	0.043
» dioxalo-diammine cobaltiate	$[Co(NH_3)_4(NO_2)_2][Co(NH_3)_2(C_2O_4)_2]$	0.000066	–
» » -triammine »	$[Co(NH_3)_4(NO_2)_2][Co(NH_3)_3(C_2O_4)_2]$	0.00059	–
» hexachloro-platinate	$[Co(NH_3)_4(NO_2)_2]_2PtCl_6$	0.00233	–
» perchlorate	$[Co(NH_3)_4(NO_2)_2]ClO_4$	0.0124	0.0290
» picrate β	$[Co(NH_3)_4(NO_2)_2]C_6H_2O(NO_2)_3$	–	0.00704
» selenate	$[Co(NH_3)_4(NO_2)_2]_2SeO_4$	–	0 0092
» sulfate	$[Co(NH_3)_4(NO_2)_2]_2SO_4$	0.00096	0.00411
» tetrachloro-aurate	$[Co(NH_3)_4(NO_2)_2]_2AuCl_4$	–	0.017
» tetranitro-diammine cobaltiate	$[Co(NH_3)_4(NO_2)_2][Co(NH_3)_2(NO_2)_4]$	0.000096	0.000355
» tetrathiocyanato-diammine chromiate	$[Co(NH_3)_4(NO_2)_2][Cr(NH_3)_2(SCN)_4]$	0.000057	0.000143
Flavo (2) tetranitro-diammine cobaltiate	$[Co(NH_3)_4(NO_2)_2][Co(NH_3)_2(NO_2)_4]$	0.000949	0.0033
Flavo tetrathiocyanato-diammine chromiate α	$[Co(NH_3)_4(NO_2)_2][Cr(NH_3)_2(SCN)_4]$	0.000322	0.00100
Flavo tetrathiocyanato-diammine chromiate β	» »	–	0.00073
Flavo chloride	$[Co(NH_3)_4(NO_2)_2]Cl$	–	0.034
Oxalo-tetrammine-cobaltic hexathiocyanato chromiate	$[Co(NH_3)_4(C_2O_4)]_3[Cr(SCN)_6]$	0.00053	–
Oxalo-tetrammine-cobaltic nitrate	$[Co(NH_3)_4(C_2O_4)]NO_3$	0.0066	0.018
» » » perchlorate	$[Co(NH_3)_4(C_2O_4)]ClO_4$	0.0051	0.0140
Oxalo-tetrammine-cobaltic trioxalo cobaltiate	$[Co(NH_3)_4(C_2O_4)]_3[Co(C_2O_4)_3]$	0.00083	–
Oxalo-tetrammine-cobaltic tetra nitro-diammine cobaltiate	$[Co(NH_3)_4(C_2O_4)][Co(NH_3)_2(NO_2)_4]$	0.00103	–
Praseo (3) bromide	$[Co(NH_3)_4Cl_2]Br$	0.00632	–
» chlorate	$[Co(NH_3)_4Cl_2]ClO_3$	0.0180	–
» chloride	$[Co(NH_3)_4Cl_2]Cl$	0.0141	–
» dioxalo-diammine cobaltiate	$[Co(NH_3)_4Cl_2][Co(C_2O_4)_2(NH_3)_2]$	0.000171	–
» hexacyano ferriate	$[Co(NH_3)_4Cl_2]_3[Fe(CN)_6]$	0.000121	–
» iodate	$[Co(NH_3)_4Cl_2]IO_3$	0.00441	–
» nitrate	$[Co(NH_3)_4Cl_2]NO_3$	0.00383	–
» picrate	$[Co(NH_3)_4Cl_2]C_6H_2O(NO_2)_3$	0.00021	–
» thiocyanate (rhodonide)	$[Co(NH_3)_4Cl_2]SCN$	0.00289	–
Sulfato-pentammine cobaltic nitrate	$[Co(NH_3)_5SO_4]NO_3$	–	0.026

(1) Croceo = Croceo cobaltic or dinitro-tetrammine cobaltic (trans).
(2) Flavo = Flavo cobaltic or dinitro-tetrammine cobaltic (cis).
(3) Praseo = Praseo cobaltic or dichloro-tetrammine cobaltic.

Solubility of Cobalt (and Other Metal) Ammonium Compounds in Water.

(Brönsted and Petersen, 1921.)

Compound.	Formula.	Gm. mols. cmpd. per 1000 cc. sat. sol. at 0°.	20°.
Magnesium dinitro-oxalo-diammine cobaltiate	$Mg[Co(NH_3)_2(NO_2)_2C_2O_4]_2$	0.00348	–
Bromo-pentammine cobaltic bromide	$[Co(NH_3)_5Br]Br_2$	0.00275	–
» » chloride	$[Co(NH_3)_5Br]Cl_2$	0.00542	0.011
» » nitrate	$[Co(NH_3)_5Br](NO_3)_2$	–	0.010
» rhodium chloride	$[Rh(NH_3)_5Br]Cl_2$	–	0.015
Chloro-aquo-tetrammine cobaltic chloride	$[Co(NH_3)_4(H_2O)Cl]Cl_2$	0.057	0.11
Chloro pentammine chromium	$[Cr(NH_3)_5Cl]X_2$	0.00066	–
» » chloride	$[Cr(NH_3)_5Cl]Cl_2$	0.0149	0.030
» » nitrate	$[Cr(NH_3)_5Cl](NO_3)_2$	–	0.055
» » oxalate	$[Cr(NH_3)_5Cl]C_2O_4$	0.00125	–
» cobaltic bromide	$[Co(NH_3)_5Cl]Br_2$	0.00725	–
» » chloride	$[Co(NH_3)_5Cl]Cl_2$	0.00914	0.018
» » iodate	$[Co(NH_3)_5Cl](IO_3)_2$	0.00200	–
» » hexachloro Pt.	$[Co(NH_3)_5Cl]PtCl_6$	0.000091	–
» » nitrate	$[Co(NH_3)_5Cl](NO_3)_2$	–	0.046
» » oxalate	$[Co(NH_3)_5Cl]C_2O_4$	0.00036	–
» » sulfate	$[Co(NH_3)_5Cl]SO_4$	–	0.29
Chloro pentammine cobaltic tetra-nitro-cobaltiate	$[Co(NH_3)_5Cl][Co(NH_3)_2(NO_2)_4]_2$	0.000173	0.000637
Chloro-pentammine rhodium chloride	$[Rh(NH_3)_5Cl]Cl_2$	0.00945	0.020
Thiocyanato-pentammine chromium chloride	$[Cr(NH_3)_5SCN]Cl_2$	–	0.040
» cobaltic »	$[Co(NH_3)_5SCN]Cl_2$	–	0.039
» » chromate	$[Co(NH_3)_5SCN]CrO_4$	0.00107	–
» » iodate	$[Co(NH_3)_5SCN](IO_3)_2$	–	0.00505
» » sulfate	$[Co(NH_3)_5SCN]SO_4$	–	0.0290
Xantho (1) chloride	$[Co(NH_3)_5NO_2]Cl_2$	–	0.11
» chromate	$[Co(NH_3)_5NO_2]CrO_4$	0.000258	0.000547
» nitrate	$[Co(NH_3)_5NO_2](NO_3)_2$	0.0170	0.038
» oxalate	$[Co(NH_3)_5NO_2]C_2O_4$	0.000161	0.000432
» tetra nitro diammine cobaltiate	$[Co(NH_3)_5NO_2][Co(NH_3)_2(NO_2)_4]_2$	0.00031	0.00099
» tetra thiocyanato diammine chromate	$[Co(NH_3)_5NO_2][Cr(NH_3)_2(SCN)_4]_2$	0.000392	0.001284
Luteo (2) cobaltic chloride	$[Co(NH_3)_6]Cl_3$	–	0.26
» » » sulfate	$[Co(NH_3)_6]Cl.SO_4$	0.01055	–
» » hexacyano chromiate	$[Co(NH_3)_6][Cr(CN)_6]$	0.000028	–
» » » cobaltiate	$[Co(NH_3)_6][Co(CN)_6]$	0.000007	0.000016
» » » ferriate	$[Co(NH_3)_6][Fe(CN)_6]$	0.000009	0.000022
» » iodate	$[Co(NH_3)_6](IO_3)_3$	0.00181	0.00458
» » nitrate	$[Co(NH_3)_6](NO_3)_3$	0.0202	0.052
» » sulfate	$[Co(NH_3)_6]_2(SO_4)_3$	0.0090	0.020
» » tetranitro cobaltiate	$[Co(NH_3)_6][Co(NH_3)_2(NO_2)_4]_3$	0.000043	–
» » trioxalo »	$[Co(NH_3)_6][Co(C_2O_4)_3]$	0.000019	–
Roseo (3) » hexacyano ferriate	$[Co(NH_3)_5H_2O][Fe(CN)_6]$	0.000172	–
» » sulfate	$[Co(NH_3)_5H_2O]_2(SO_4)_3$	–	0.016
» » tetrathiocyanato-diammine chromiate	$[Co(NH_3)_2H_2O][Cr(NH_3)_2(SCN)_4]$	0.00006	–
Iso-rhodano (4) pentammine cobaltic sulfate	$[Co(NH_3)_5Rh]SO_4$	0.01177	–

(1) Xantho cobaltic or nitro-pentammine cobaltic.
(2) Luteo cobaltic or hexammine cobaltic.
(3) Roseo cobaltic or aquo-pentammine cobaltic.
(4) Brönsted, 1920.

Solubility of Cobalt Ammonium Compounds in Water at 20°.

(Brönsted, 1923.)

Compound.	Formula.	Gms. mols. cmpd. per 1000 cc. sat. sol.
Oxalotetrammine cobaltic–tetrathiocyanato diammine chromiate	$\left\{\begin{matrix}[Co(NH_3)_4C_2O_4] \\ [Cr(NH_3)_2(CNS)_4]\end{matrix}\right\}$	0.00139
Oxalotetrammine cobaltic–oxalodinitro–diammine cobaltiate	$\left\{\begin{matrix}[Co(NH_3)_4C_2O_4] \\ [Co(NH_3)_2(NO_2)_2(C_2O_4)]\end{matrix}\right\}$	0.00067
Nitrothiocyanato-tetra ammine cobaltic-oxalodinitro diammine cobaltiate	$\left\{\begin{matrix}[Co(NH_3)_4(CNS)(NO_2)] \\ [Co(NH_3)_2(NO_2)_2(C_2O_4)]\end{matrix}\right\}$	0.000449
Oxalotetrammine cobaltic persulfate	$[Co(NH_3)_4(C_2H)]_2S_2O_8$	0.000755
Oxalotetrammine cobaltic dithionate	$[Co(NH_3)_4(C_2O_4)]_2S_2O_6$	0.000201
Luteocobaltic-hexacyano-cobaltiate (1)	$[Co(NH_3)_6][Co(CN)_6]$	0.00001375 (18°)

(1) Brönsted and Brumbaugh, 1926.

Solubility of Chloro-Pentammine Cobalt Chloride in Water.

(Lamb and Simmonds, 1924.)

Formula.	t°.	$d\frac{t°}{4°}$ of sat. sol.	Gms. $[Co(NH_3)_5Cl]Cl_2$ per 1000 cc. sat. sol.	Gms. $[Co(NH_3)_5Cl]Cl_2$ per 100 gms. H_2O.
$[Co(NH_3)_5Cl]Cl_2$	0.0	1.00096	2.244	0.2228
»	29.7	0.9994	6.047	0.6088
»	50.0	0.9945	10.01	1.025

Solubility of Several Cobalt Ammonium Compounds in Water.

(Benrath, 1926; Benrath and Wurzburger, 1924.)

Compound.	Formula.	t°.	Gms. Co per 100 gms. H_2O.
Chloro pentammine cobalt (3) chloride	$[Co(NH_3)_5Cl]Cl_2$	25	0.1337*
» (3) sulfate	$[Co(NH_3)_5Cl]SO_4$	25	0.243
Hexammine cobalt (3) nitrate	$[Co(NH_3)_6]NO_3$	30	0.450
» (3) sulfate	$[Co(NH_3)_6]_2(SO_4)_3.5H_2O$	25	0.342
» »	»	45	0.552

* This value was obtained by constant shaking for one day. After a period of 10 days it rose to 0.176 gm. Co per 100 gms. H_2O. The authors also give data for the solubility of the above compounds in aqueous solutions of HCl, KCl, $HgCl_2$, H_2SO_4 and HNO_3. Double compounds are formed in some cases.

Solubility of Several Cobalt Ammonium Compounds in Water at 20°.

(Ephraim and Flugel, 1924.)

Compound.	Formula.	Per 1000 cc. sat. sol. Gms. Co.	Gms. atoms. Co
Sulfato-aquo-tetrammine cobaltic sulfate	$[Co(NH_3)_4H_2O(SO_4)]_2SO_4.4H_2O$	–	0.1254
» » » chloride	$[Co(NH_3)_4H_2O(SO_4)]Cl$	–	0.2726
» » » perchlorate	$[Co(NH_3)_4H_2O(SO_4)]ClO_4$	–	0.1508
» » » nitrate	$[Co(NH_3)_4H_2O(SO_4)]NO_3$	–	0.0712
» » » bromide	$[Co(NH_3)_4H_2O(SO_4)]Br$	–	0.0677
» » » picrate	$[Co(NH_3)_4H_2O(SO_4)]C_6H_2N_3O_7$	–	0.0093
Sulfato pentammine chloride	$[Co(NH_3)_5SO_4]Cl$	17.77	0.2881
» » iodide	[»]I	2.19	0.0371
» » picrate	[»]$C_6H_2N_3O_7.2H_2O$	0.100	0.00169
» » chromate	[»]$_2CrO_4$	0.609	0.0103
» » bichromate	[»]$_2Cr_2O_7$	0.315	0.00534
» » chlorate	[»]ClO_3	3.90	0.0661
» » perchlorate	[»]ClO_4	2.15	0.0364
» » silicofluoride	[»]$_2SiF_6$	8.62	0.1461
» » sulfate	[»]$_2SO_4$	20.44	0.3464
» » bromide	[»]Br	2.95	0.0500
» » nitrate	[»]NO_3	1.61	0.0273
Roseo iodo sulfate	$[Co(NH_3)_5H_2O]ISO_4$	(18°) 0.9625 =	0.0163 n

Solubility of Cobalt Hexammine Salts in Water at 17°.5. (9°?)

(Ephraim and Mosimann. 1922.)

Compound.	Formula.	Per liter sat. sol. Gms. Co.	Gm. mols. salt.
Cobalthexammine chloride	$[Co(NH_3)_6]Cl_3$	11.8	0.20
» bromide	[»]Br_3	2.404	0.04
» iodide	[»]I_3	0.819	0.015
» nitrate	[»]$(NO_3)_3$	1.974	0.033
» sulfate	[»]$_2(SO_4)_3$	1.792	0.015
» perchlorate	[»]$(ClO_4)_3$	0.794	0.013
» chlorate	[»]$(ClO_3)_3$	12.71	0.215
» chromate	[»]$_2(CrO_4)_3$	0.0647	0.00055
» bichromate	[»]$_2(Cr_2O_7)_3$	0.0332	0.00029
» oxalate	[»]$_2(C_2O_4)_3$	0.0816	0.00069
» phosphate	[»]PO_4	0.329	0.00055
» naphtalene β sulfonate	[»]$[C_{10}H_7SO_3]_3$	0.346	0.00059
» picrate	[»]$[O.C_6H_2(NO_2)_3]_3$	0.247	0.00042

The saturated solutions were prepared by agitation for not more than 2 hours, on account of the rapidity of decomposition, which was greater in the case of the chlorate and perchlorate than with the other salts. The temperature is given both as 17°.5 and as 9°. In a later paper by Ephraim (1923) exactly the same results are given for the temperature 18°.

Solubility of Cobalt Ammonium Compounds in Water.

(Ephraim, 1923.)

Formula.	t°.	Gm. mols. cmpd. per liter.	Formula.	t°.	Gm. mols. cmpd. per liter.
$[Co(NH_3)_5Cl](ClO_4)_2$	19	0.0917	$[Co(NH_3)_5I]Br_2$	20	0.00076
[»]$(NO_3)_2$	19	0.0434	[»]$[O.C_6H_2(NO_2)_3]_2$	20	0.00005
[»]I_2	19	0.0418	$[Co(NH_3)_5NO_2]Cl_2$*	19	0.1064
[»]SO_4	19	0.0344	[»]I_2(hairy cryst.)	19	0.0945
[»]Br_2	19	0.0178	[»]I_2(octoh. cryst.)	19	0.0846
[»]Cl_2	19	0.0170	[»]$(ClO_4)_2$	19	0.0525
[»]Cr_2O_7	19	0.0050	[»]SO_4	19	0.0442
[»]$[C_{10}H_7SO_3]_3.6H_2O$	19	0.00126	[»]Br_2	19	0.0436
[»]SiF_6	19	0.00111	[»]$(NO_3)_2$	19	0.0368
[»]S_2O_3	19	0.00102	[»]SiF_6	19	0.00259
[»]C_2O_4	19	0.00074	[»]Cr_2O_7	19	0.0018
[»]CrO_4	19	0.00041	[»]$[C_{10}H_7SO_3]_3.3H_2O$	19	0.00073
[»]$[O.C_6H_2(NO_2)_3]$	19	0.00017	[»]CrO_4	19	0.00062
$[Co(NH_3)_5Br](ClO_4)_2.H_2O$	20	0.0837	[»]$[O.C_6H_2(NO_2)_3]_2$	19	0.00050
[»]SO_4	20	0.0246	[»]C_2O_4	19	0.00042
[»]$(NO_3)_2$	20	0.0107	$[Co(NH_3)_5NO_3](ClO_3)_2$**	18	0.0970
[»]Cl_2	20	0.0106	[»]Cl_2	18	0.0279
[»]I_2	20	0.0101	[»]$(ClO_4)_2$	18	0.0278
[»]Br_2	20	0.00614	[»]I_2	18	0.0271
[»]SiF_6	20	0.00278	[»]Br_2	18	0.0159
[»]$[C_{10}H_7SO_3]_3.6H_2O$	20	0.0007	[»]$(NO_3)_2$	18	0.0122
[»]C_2O_4	20	0.0005	[»]SO_4	18	0.0050
[»]CrO_4	20	0 0004	[»]C_2O_4	18	0.0043
[»]$[O.C_6H_2(NO_2)_3]_2$	20	0.0003	[»]SiF_6	18	0.0038
$[Co(NH_3)_5I]Cl_2$	20	0.0154	[»]Cr_2O_7	18	0.00103
[»]SO_4	20	0.00529	[»]$[C_{10}H_7SO_3]_3.3H_2O$	18	0.00086
[»]$(ClO_3)_2$	20	0.00244	[»]CrO_4	18	0.00061
[»]$(NO_3)_2$	20	0.00217	[»]$[O.C_6H_2(NO_2)_3]_3$	18	0.00059
[»]I_2	20	0.0020			

* Xantho salts = Nitro pentammine cobaltic salts.

** Nitrato pentammine cobaltic salts.

SOLUBILITY OF COBALT AMMONIUM COMPOUNDS IN WATER. (Ephraim, 1923.)

Formula.	t°.	Gm. mols. cmpd. per liter.	Formula.	t°.	Gm. mol. cmpd. per liter.
$[Co(NH_3)_5H_2O]Cl_3$	17.5	0.859	$[Co(NH_3)_5H_2O]_2(Cr_2O_7)_3$	17.5	0.00037
» $]Br_3$	17.5	0.346	» $][O.C_6H_2(NO_2)_3]_3$	17.5	0.00024
» $](ClO_4)_3$	17.5	0.207	$[Co(NH_3)_5(H_2O)_2]Cl_3$	22	1.83
» $]I_3$	17.5	0.155	» $]Br_3$	22	1.67
» $](NO_3)_3$	17.5	0.153	» $](NO_3)_3$	22	1.03
» $]_2(SO_4)_3$	17.5	0.047	» $]_2(SO_4)_3$	22	0.1752
» $]_2(CrO_4)_3$	17.5	0.0019	» $][C_{10}H_7SO_3]_3.6H_2O$	22	0.007
» $][C_{10}H_7SO_3]_3.3H_2O$	17.5	0.00064			

SOLUBILITY OF DINITRO TETRAMMINE COBALTI FLAVO AND CROCEO SALTS IN WATER. (Ephraim, 1923.)

Flavo Salts (cis compounds) At 23°.

Formula.	Gm. mols. cmpd. per liter.
cis $[Co(NH_3)_4(NO_2)_2]Cl$	0.260
» $]Br$	0.193
» $]NO_3$	0.132
» $]I$	0.090
» $]ClO_4$	0.0586
» $]C_{10}H_7SO_3$	0.00895
» $]_2SiF_6$	0.00725
» $]_2SO_4$	0.00725
» $]_2Cr_2O_7$	0.00332
» $]_2CrO_4$	0.00258
» $]O.C_6H_2(NO_2)_3$	0.00158

Croceo Salts (trans compounds) At 18°.

Formula.	Gm. mols. cmpd. per liter.
trans $[Co(NH_3)_4(NO_2)_2]Cl$	0.0397
» $]Br$	0.0268
» $]ClO_3$	0.0253
» $]ClO_4$	0.0242
» $]I$	0.0198
» $]_2Cr_2O_7$	0.0160
» $]NO_3$	0.0119
» $]SiF_6$	0.0110
» $]O.C_6H_2(NO_2)_3$	0.00561
» $]_2SO_4$	0.00364
» $]_2CrO_4$	0.00310

Data for the solubility of **Nitro Rhodano Tetrammine Cobalti Chloride**, $[Co(NH_3)_4NO_2(SCN)]Cl$, in aqueous 0.1 normal solutions of HCl, LiCl, NaCl, KCl and CsCl are given by Gütelberg and Pedersen, 1926. This compound was chosen even though it could not be prepared completely pure, just as is the case with the larger number of metal ammoniates. Also, it is not completely stable in solution. It was found that the solubility increases with time of rotation about 1 per cent per hour. From determinations after various periods of rotation the solubility at 0 time of rotation was estimated to be 0.012 gm. mols. per 1000 gms. H_2O at 20°.

COBALT BENZOATE, CHLORO BENZOATE, etc.

SOLUBILITY OF EACH IN WATER AT 20°. (Ephraim and Pfister, 1923.)

Compound.	Formula.	Gms. anhydrous compound per 100 cc. sat. sol.
Cobalt benzoate	$(C_6H_5COO)_2Co.4H_2O$	1.013
» -4-chloro benzoate	$(C_6H_4.Cl.COO)_2Co.4H_2O$	1.720
» -4-methoxy »	$(C_6H_4.OCH_3.COO)_2Co.3H_2O$	0.9934
» -4 nitro »	$(C_6H_4.NO_2.COO)_2Co.6H_2O$	0.893
» -4-oxy »	$(C_6H_4\ OH.COO)_2Co.7H_2O$	1.254
» cinnamate	$C_{18}H_{14}O_4Co.2H_2O$	0.302

COBALT Potassium CARBONATE $CoK_2(CO_3)_2.4H_2O$.

Data for the solubility of this double salt in aqueous solutions of potassium carbonate and bicarbonate at 18° are given by Appleby and Lane, 1918. In the absence of $KHCO_3$ basic compounds precipitate before attainment of equilibrium. Results are given for solutions containing an excess of $KHCO_3$. The concentrations of cobalt were about 0.1 to 0.2 gm. per liter.

COBALT CHLORIDE $CoCl_2.6H_2O$.

Solubility of Cobalt Chloride in Aqueous Solutions of Hydrochloric Acid at 0°. (Foote, 1923.)

Gms. per 100 gms. sat. sol. $CoCl_2$.	Gms. per 100 gms. sat. sol. HCl.	Solid Phase.	Gms. per 100 gms. sat. sol. $CoCl_2$.	Gms. per 100 gms. sat. sol. HCl.	Solid Phase.
31.66	0.00	$CoCl_2.6H_2O$	6.34	29.38	$CoCl_2.6H_2O$
25.58	3.26	»	9.91	29.15	»
17.78	8.74	»	11.58	28.97	»
12.79	12.44	»	12.42	29.14	»+ $CoCl_2.2H_2O$
5.97	19.01	»	12.88	28.84	» »
4.74	20 51	»	12.66	30.27	$CoCl_2.2H_2O$
2.69	25.66	»	15.11	33.03	»
3.07	27.27	»	15.12	33 86	»

Solubility of Cobalt Chloride at 20° in Aqueous Solutions of : (Mazzetti, 1926.)

Potassium Chloride. Gms. per 100 gms. sat. sol. $CoCl_2$.	Gms. per 100 gms. sat. sol. KCl.	Solid Phase.	Sodium Chloride. Gms. per 100 gms. sat. sol. $CoCl_2$.	Gms. per 100 gms. sat. sol. NaCl.	Solid Phase.
33.52	4.73	$CoCl_2.6H_2O$	34.98	0.00	$CoCl_2.6H_2O$
33.15	6.81	»+ KCl	33.38	3.35	»
31.58	6 79	KCl	33.05	3 65	»+ NaCl
29.17	7.19	»	32.84	3.91	NaCl
28.37	7.70	»	28.26	6.07	»
27.90	8.69	»	27.73	6.63	»
26.45	8.45	»	21.45	10.32	»
20.25	11 56	»	13.63	15.71	»
14.05	15.05	»	8.20	19.40	»
7.40	19.37	»	0.00	26.09	»

100 gms. sat. solution of $CoCl_2$ in selenium oxychloride ($SeOCl_2$) contain 0.17 gm. $CoCl_2$ at 25°. (Wise, 1923.)

COBALT FUMARATE $Co.C_4H_2O_4.4H_2O$.

100 gms. H_2O dissolve 0.88 gm. $CoC_4H_2O_4$ at 30°. (Weiss and Downs, 1923.)

COBALT HELIANTHATE $Co(C_{14}H_{14}N_3SO_3)_2.4H_2O$.

1000 cc. H_2O dissolve 0.036 gm. of the hydrated salt at 20-25°. (Stark and Dehn, 1918.)

COBALT HYDROXIDE (ic) $Co(OH)_3$.

1000 cc. ordinary distilled H_2O, containing a little CO_2, dissolve 0.00318 gm. $Co(OH)_3$ at 20°. (Almkvist, 1918.)

COBALT Nitroso phenyl HYDROXYL AMINE.

100 gms. H_2O dissolve $12.5.10^{-4}$ gm. of the salt at 18°. (Martin.)

COBALT Xylol SELENATES and SULFONATE.

Solubility of Each in Water. (Anschütz, Kallen and Riepenkröger, 1919.)

Compound.	Formula.	t°	Gms. anhydrous cmpd per 100 gms. H_2O.
Cobalt ortho xylol selenate..	$[(CH_3)_2.1.2.C_6H_3.4.SeO_3]_2Co.5H_2O$	18°	0.66
» para » ..	$[(CH_3)_2.1.4.C_6H_3.4.SeO_3]_2Co.9H_2O$	15°	1.38
» ortho » sulfonate.	$[(CH_3)_2.1.2.C_6H_3.4.SO_3]_2Co.5H_2O$	16°	2.10

COBALT SULFIDE CoS.

1000 cc. aq. 2.0 normal H_2SO_4, saturated with H_2S at 1 atmosphere pressure, dissolve 0.0156 gms. CoS at 20°. (Moser and Behr, 1924.)

COBALT Benzene SULFONATE $(C_6H_5SO_3)_2Co.6H_2O$.

Solubility of Cobalt Benzene Sulfonate in Water. (Ephraim and Seger, 1925; Ephraim and Pfister, 1925.)

t°.....	17°.	20°.	36°.	50°.	65°.	80°.5.
Gms. $(C_6H_5SO_3)_2Co$ per 100 cc. sat. sol.	7.535	7.778	11.086	14.144	19.717	26.735

SOLUBILITY OF SEVERAL COBALT SULFONATES IN WATER.
(Ephraim and Pfister, 1925.)

Compound.	Formula.	t°.	Gms. anhydrous cmpd. per 100 cc. sat. sol.
Cobalt anthracene-1-sulfonate	$(C_{14}H_9SO_3)_2Co.6H_2O$	20	0.391
» » -2- »	$(C_{14}H_9SO_3)_2Co.6H_2O$	20	0.00519
» naphtalene-1- »	$(C_{10}H_7SO_3)_2Co.6H_2O$	17	6.417
» » -2- »	$(C_{10}H_7SO_3)_2Co.6H_2O$	20	0.209
» » » »	» »	32	0.312
» » » »	» »	45	0.455
» » » »	» »	59	0.737
» » » »	» »	74	1.216
» » » »	» »	82	1.568
» » -5-Chlor-1-Sulfonate	$(C_{10}H_6SO_3Cl)_2Co.4H_2O$	20	0.709
» » -6-Oxy-2 »	$(C_{10}H_7SO_3)_2Co.8H_2O$	20	0.500
» 2.6.8 naphthylamine disulfonate	$C_{10}H_5NH_2.(SO_3)_2Co$	15	27.96*
» 2.5.7 » »	» »	»	29.4*

*These determinations are by Braunschweig 1922, 1926; and refer to grams per 100 gms. of the sat. solution instead of gms. per 100 cc. sat. solution.

COBALT Pyridine **NITRATE** $Co(NO_2)_3.3C_5H_5N$.

100 gms. sat. solution of $Co(NO_2)_3.3C_5H_5N$ in pyridine contain 0.20 gm. Co at 0°, 0.29 gm. at 10°, 0.40 gm. at 20° and 0.49 gm. at 25°. (Le Boucher, 1926.)

COCAINE $C_{17}H_{21}NO_4$ (Benzoyl ecgonine methyl ester).

SOLUBILITY IN WATER. (Kolthoff, 1925.)

By means of colorimetric determinations of the p_H of mixtures of 5 cc. of 0.05 molecular cocaine hydrochloride and 0.01 normal sodium hydroxide solutions the dissociation constant was calculated to be $K = 2.6.10^{-6}$. For the determination of the solubility product (L), 2 cc. portions of 0.05 molecular cocaine hydrochloride were mixed in tubes of resistance glass with different amounts of 0.01 normal Na OH, shaken and allowed to stand. With 2.0 cc. of 0.01 normal Na OH crystals separated after 4 hours. From this experiment the solubility product was calculated to be $L = 1.10^{-8}$ at 15°. The concentration of the undissociated alkaloid in the saturated solution is derived thus.

$$[\text{Cocaine OH}]\,\text{sat.} = \frac{L}{K} = \frac{1.10^{-8}}{2.6.10^{-6}} = 4.10^{-3}\ \text{mol.}$$

"The concentration of the dissociated part is 10^{-4} mol., so that the total solubility of cocaine in water is 4.10^{-3} mol."

Tropa**COCAINE** $C_8H_{14}NO.CO.C_6H_5$.

SOLUBILITY IN WATER. (Kolthoff, 1925.)

The dissociation constant was calculated from the colorimetrically determined p_H curve to be $K = 1.9.10^{-5}$. For the solubility product it was found that 5.0 cc. of a 0.1 molecular tropacocaine hydrochloride solution + 2.0 cc. of 0.055 normal Na OH gave a just perceptible precipitate of tropacocaine after standing a day. The p_H of the solution was 8.4 corresponding to a $p_{OH} = 5.8$ and a $[OH'] = 16.10^{-6}$. From the composition of the solution and the hydroxyl ion concentration the solubility product was calculated to be 8.10^{-8}. From this and the dissociation constant it was calculated that a saturated solution of tropacocaine in water at 15° has a concentration of $4.3.10^{-3}$ mol.

CODEINE HYDROCHLORIDE $C_{18}H_{21}NO_3.HCl.2H_2O$.

100 gms. H_2O dissolve 3.51 gms. $C_{18}H_{21}NO_3.HCl.2H_2O$ at 15°.5. (Wilson, 1923.)

CODEINE PICRATE $C_{18}H_{21}NO_3.HO.C_6H_2(NO_2)_3$ (m. pt. 196°.7).

100 gms. sat. solution of codeine picrate { in water contain 0.11 gm. $C_{18}H_{21}NO_3.HOC_6H_2(NO_2)_3$ at 20°; in abs. alcohol » 0.095 » » » » »; in acetone » 3.89 » » » » »

(Maplethorpe and Evers, 1925.)

COMENIC ACID $C_6H_4O_5$.

100 gms. sat. sol. in water contain 0.51 gm. $C_6H_4O_5$ at 25°. (Verkade, 1924.)
" " in 0.5 molecular H_3BO_3 solution contain 0.51 gm. $C_6H_4O_5$ at 25°

CONINE (α Propyl Piperidine) $C_5H_{10}N.C_3H_7$.

DISTRIBUTION OF CONINE AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Ether.			Water and Xylene.		
Millimols. per liter of			Millimols. per liter of		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.19	1.055	5.55	0.146	0.861	5.9
0.33	1.875	5.68	0.265	1.735	6.5
0.62	3.72	7.16	0.495	3.505	7.1
1.06	7.38	6.95	0.935	9.065	9.8

COPPER Cu.

Data for the distribution of Copper between, Zinc and Lead, Zinc and Bismuth, Aluminium and Lead and Aluminium and Bismuth are given by Tammann and Schaftmeister, 1924.

COPPER ACETATE $Cu(CH_3COO)_2.H_2O$.

SOLUBILITY OF COPPER ACETATE IN AQUEOUS SOLUTIONS OF POTASSIUM ACETATE AT 25°. (Büttgenbach, 1925.)

The original determinations were evidently published in the author's dissertation (Aachen, 1925). Since this was not available the following approximate values were read from the small scale diagram given in the condensed account of the work published in the Z. anorg. allgem. chem.

	Gms. per 100 cc. sat. sol.				Gms. per 100 cc. sat. sol.		
d_{25} of sat. sol.	Cu.	CH_3COOK.	Solid Phase.	d_{25} of sat. sol.	Cu.	CH_3COOK.	Solid Phase.
1.05	2.4	0.0	$Cu(CH_3COO)_2.H_2O$	1.27	2.0	52.0	1.1.1
1.06	1.4	7.0	»	1.31	1.65	64.0	»
1.10	1.3	12.0	»	1.33	1.8	72.0	»
1.12	1.4	17.0	»	1.34	1.95	74.0	» +1.3
1.14	1.6	22.0	»	1.36	1.4	84.0	1.3
1.16	2.0	28.5	»	1.38	1.7	100.0	»
1.19	2.4	34.0	»	–	0.15	112.0	1.3+$CH_3COOK.1^1/_2H_2O$
1.23	3.0	41.0	» +1.1.1	–	0.00	104.0	$CH_3COOK.1^1/_2H_2O$
1.25	2.4	46.0	1.1.1				

1.1.1 = $Cu(CH_3COO)_2.CH_3COOK.H_2O$; 1.3 = $Cu(CH_3COO)_2.3CH_3COOK$.

A portion of the 40° curve near the tr. pt. 1.1.1 + 1.3 is also given.

COPPER AMMONIUM COMPOUNDS of the type $[Cu(NH_3)_6]X_2$.

[SOLUBILITY OF COPPER AMMONIATES IN AQUEOUS ALCOHOL AT 16°.
(Ephraim and Mosimann, 1922.)

The solvent was in all cases a mixture of 66.6 vol. per cent of aqueous ammonia of $d_{16} = 0.912$ and 33.3 vol. per cent of 96 % alcohol.

Compound.	Formula.	Per liter of sat. sol.	
		Gms. Cu.	Gm. mols. salt.
Copper hexammine Bromide....	$[Cu(NH_3)_6]Br_2$	5.686	0.0903
» Chloride....	$[Cu(NH_3)_6]Cl_2$	47.7	0.757
» Iodide.....	$[Cu(NH_3)_6]I_2$	4.11	0.065
» Nitrate.....	$[Cu(NH_3)_6](NO_3)_2$	10.15	0.161
» Sulfate.....	$[Cu(NH_3)_6]SO_4$	0.0425	0.00063

Data for the solubility of the blue cupro-cupri-cyanide-ammonia salt, $[Cu_2(CN)_4(NH_3)_4]Cu$ and of the corresponding green salt, $[Cu_2(CN)_4(NH_3)_3]Cu$ in ammonia water of various concentrations, are given by Benrath and Schröder, 1924. It was desired to learn by solubility determinations whether the ammonia rich salt could be obtained from the ammonia poor salt by treatment of the latter with aqueous ammonia.

COPPER BENZOATES $(C_6H_5COO)_2Cu.4H_2O$, etc.

Solubility of Copper Benzoates in Water at 20°.
(Ephraim and Pfister, 1925.)

Compound.	Formula.	Gms. anhydrous cmpd. per 100 cc. sat. sol.
Copper benzoate	$(C_6H_5.COO)_2Cu.4H_2O$	0.100
» -4-Chloro benzoate	$(C_6H_4Cl\ COO)_2Cu.2H_2O$	0.192
» -4-Nitro »	$(C_6H_4NO_2.COO)_2Cu.H_2O$	0.161
» -4-Oxy »	$(C_6H_4OH.COO)_2Cu.7H_2O$	0.242
» cinnamate	$C_{18}H_{14}O_4.Cu$	0.0304

COPPER CARBONATE $CuCO_3$.

100 gms. of a sat. solution of copper carbonate in water at 18° and in contact with CO_2 at a pressure of 1 atmosphere, contain 0.03 gm. $CuCO_3$. At a pressure of 56 atmospheres of CO_2 the sat. solution contains 0.041 gm. $CuCO_3$. (Haehnel, 1924.)

COPPER Sodium CARBONATE $CuNa_2(CO_3)_2.3H_2O$.

Solubility of Mixtures of Copper Sodium Carbonate and Sodium Bicarbonate in Water at 18°. (Appleby and Lane, 1918.)

Gms. per liter of sat. solution.			
Na_2CO_3.	$NaHCO_3$.	Cu.	Solid Phase.
9.27	87.79	–	$CuNa_2(CO_3)_2.3H_2O$
11.08	86.45	0.0509	»+$NaHCO_3$
13.44	85.27	0.0542	» »
96.68	65.31	0.1061	» »
168.75	53.60	0.1553	» »
185.02	53.77	–	» »+$Na_2CO_3.10H_2O$
197.08	18.94	0.257	»+$Na_2CO_3.10H_2O$

No evidence of the presence of trona ($Na_2CO_3.NaHCO_3.2H_2O$) at 18° was obtained.

COPPER CHLORIDE (ic) $CuCl_2.2H_2O$.

Equilibrium in the System Copper Oxide, Hydrochloric Acid and Water at 25°. (Britton, 1925.)

The saturated solutions were prepared from moist hydrated copper oxide, moist basic cupric chloride, hydrochloric acid and cupric chloride solution. Equilibrium was attained in about a week, but final analyses of the solutions and air dried solid phases were made only after three months. The terms in which the results are expressed are not clearly defined.

Liquid phases.			Liquid phases.		
% CuO.	% HCl.	Solid Phase.	% CuO.	% HCl.	Solid Phase.
0.0	0.0	$4CuO.2HCl.3H_2O$+CuO (hydrate)	15.22	13.96	$4CuO.2HCl.3H_2O$
0.16	0.15	$4CuO.2HCl.3H_2O$	18.52	17.03	»
3.90	3.57	»	21.24	19.49	»
8.35	7.66	»	25.59	23.51	»+$CuCl.2H_2O$

Solubility of Cupric Chloride in Aqueous Solutions of Hydrochloric Acid.
(Foote, 1923.)

Results at 0°. Gms. per 100 gms. sat. sol.			Results at 25°. Gms. per 100 gms. sat. sol.		
$CuCl_2$.	HCl.	Solid Phase.	$CuCl_2$.	HCl.	Solid Phase.
40.92	0.0	$CuCl_2.2H_2O$	43.32	0.0	$CuCl_2.2H_2O$
34.82	3.72	»	32.85	6.52	»
23.82	10.35	»	23.74	12.95	»
15.64	16.71	»	18.34	18.08	»
12.12	21.82	»	17.01	22.26	»
13.86	29.02	»	18.20	25.07	»
17.42	31.16	»+$HCl.CuCl_23H_2O$	22.65	27.76	»
15.66	32.66	$HCl.CuCl_2.3H_2O$	24.07	28.05	»
12.29	36.82	»	25.65	28.49	»
11.85	37.19	»			

SOLUBILITY OF CUPRIC CHLORIDE IN AQUEOUS SOLUTIONS OF LITHIUM CHLORIDE AT 30° AND VICE VERSA. (Schreinemakers, and Noorduyn, 1918.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$CuCl_2$.	LiCl.	Solid Phase.	$CuCl_2$.	LiCl.	Solid Phase.
43.4	0.0	$CuCl_2.2H_2O$	19.6	26.2	$CuCl_2.2H_2O$+1.1.2
40.2	2.5	»	16.2	28.6	1.1.2
39.5	2.9	»	13.6	29.7	»
35.5	5.7	»	7.3	36.3	»
34.9	6.2	»	4.4	40.3	»
27.9	11.8	»	2.7	42.8	»
24.2	13.8	»	1.8	45.4	»+$LiCl.H_2O$
22.7	16.3	»	1.7	45.5	$LiCl.H_2O$
20.7	19.0	»	0.0	46.3	»

1.1.2 = $CuCl_2.LiCl.2H_2O$.

COPPER CHLORIDE (ous) CuCl.

SOLUBILITY OF CUPROUS CHLORIDE IN AQUEOUS SOLUTIONS OF POTASSIUM CHLORIDE AT 25° AND VICE VERSA. (Valeton and Frömel, 1924.)

Mols. per 100 mols. of mixture			Mols. per 100 mols. of mixture			Mols. per 100 mols. of mixture		
CuCl.	KCl.	Solid Phase.	CuCl.	KCl.	Solid Phase.	CuCl.	KCl.	Solid Phase.
0.27	0.09	CuCl	1.75	1.15	1.1.1	0.90	1.15	1.2
0.68	0.18	»	1.66	1.20	»	0.80	1.05	»
0.96	0.25	»	1.65	1.24	»	0.52	0.85	»
1.91	0.54	»	1.55	1.25	»	0.40	0.80	»
2.10	0.62	»	1.44	1.45	»	0.30	0.75	»
2.05	0.90	»+1.1.1	1.32	1.62	»+1.2	0.25	0.75	»+KCl
1.97	0.95	1.1.1	1.25	1.55	1.2	0.25	0.85	KCl
1.90	1.00	»	1.25	1.50	»	0.23	0.90	»
1.85	1.05	»	1.10	1.35	»	0.20	1.49	»
1.80	1.10	»	1.00	1.22	»	0.00	8.0	»

1.1.1 = $CuCl.KCl.H_2O$ 1.2 = $CuCl.2KCl$.

Fusion point data for mixtures of Cu Cl and Hg Cl are given by Janecke, 1923.

COPPER FUMARATE $C_4H_2O_4.Cu.2H_2O$.

100 gms. H_2O dissolve 0.02 gm. $C_4H_2O_4.Cu$ at 30°. (Weiss and Downs, 1923.)

COPPER HELIANTHATE $(C_{14}H_{11}N_2SO_3)_2Cu.4H_2O$.

1000 cc. H_2O dissolve 0.122 gm. of the hydrated salt at 20-25°. (Stark and Dehn, 1918.)

COPPER HYDROXIDE (ic) $Cu(OH)_2$.

1000 cc. of H_2O saturated with copper (oxide) hydroxide contain :

6.1^{-5} Gm. mols $Cu(OH)_2$ at room temperature. (Jellinek and Gordon, 1924.)

6.9^{-5} Gm. mols $Cu(OH)_2$ at 18°. (Remy, 1925; Remy and Kuhlmann, 1924.)

The determinations were made in both cases by electrolytic methods.

THE SOLUBILITY OF CUPRIC HYDROXIDE IN CONCENTRATED SOLUTIONS OF SODIUM HYDROXIDE AND OF POTASSIUM HYDROXIDE. (Justin-Mueller, 1918.)

The determinations were made by adding 20 cc. of a 10 % solution of $CuSO_4.5H_2O$, corresponding to 0.78 gm. of $Cu(OH)_2$, to Na OH and K OH solutions of different concentrations, untill a point was reached at which the initial precipitate of cupric hydroxide redissolved completely. In this way it was found that 0.78 gm. $Cu(OH)_2$ dissolved completely in 100 cc. of aq. Na OH of $d = 1.345 - 1.370$, and in 100 cc. of aq. K OH of $d = 1.453 - 1.498$. At lower concentrations of the caustic, or with increased amounts of copper, solution was incomplete.

EQUILIBRIUM IN THE SYSTEM COPPER OXIDE, COPPER HYDROXIDE, CUPRIT AND CAUSTIC SODA. (E. Muller, 1920 and 1923.)

The author gives numerical data for the solubility of Cu O and of Cu $(OH)_2$ in caustic soda solutions of concentrations varying from 0 to 20 normal, at various temperatures and lengths of time of shaking. The rapidity with which equilibrium was reached varied with the concentration of the sodium hydroxide. A selection of the results representing final equilibrium is difficult and their value for practical purposes is uncertain. For this reason a choice of the author's determinations was not made for the present compilation. Among the conclusions drawn from the work, may be mentioned the following :

(1) Blue copper hydroxide dissolves in considerable amount in strong caustic soda solutions of less than 17 normal, and from such solutions a brownish black precipitate gradually separates. The undissolved material also gradually becomes brown. These dark colored compounds are probably solid solutions of Cu O and Cu $(OH)_2$ in which the relation of Cu $(OH)_2$ to water content has a general connection with the copper concentration of the supernatant solution. The dehydration of Cu $(OH)_2$ takes place gradually over a considerable series of these solid solutions but does not go to anhydrous Cu O.

(2) The solubility of Cu O and of Cu $(OH)_2$ increases at first with the strength of the caustic, but beyond a certain concentration it diminishes. The solubility of Cu $(OH)_2$ is considerably greater than that of Cu O, especially in dilute solutions. Both Cu O and Cu $(OH)_2$ are converted to cuprit, by treatment with strong caustic solutions.

(3) A copper (2) acid sodium can be crystallized from aqueous alkali solutions and it possesses a cobalt color and probably has the composition Na_2 Cu O_2.

(4) The opinion that copper hydroxide dissolves as a colloid is no longer justified.

A series of determinations by Melbye, 1922, made by the very gentle addition of a solution of copper sulfate to sodium hydroxide solutions untill turbidity appeared, gave results which showed that between 2.65 and 6.6 normal Na OH, the solubility of copper hydroxide increases at a linear rate (from 0.028 to 0.195 normal) with the concentration of the Na OH. These results did not agree with previous determinations by Fischer (Z. anorg. allgem. chem., 40, 39, 1904) and by Muller (Z. anorg. allgem. chem., 54, 417, 1907).

Data for the system Cu $(OH)_2$ + Ag NO_3 + H_2O at 20° are given by Malquori, 1925. The results show the range of Ag NO_3 concentration over which basic Cu $(OH)_2$ — Ag NO_3 salts exist.

COPPER Nitroso phenyl HYDROXYLAMINE.

100 gms H_2O dissolve $1.2.10^{-5}$ gms. of the compound at 18°. (Martin.)

COPPER IODIDE (ous) Cu I.

100 cc. pyridine dissolve 1.74 gm. Cu I at 25°. (Müller R., 1924.)

COPPER MALEATE $C_4H_2O_4Cu.H_2O$.

100 gms. H_2O dissolve 0.12 gm. $C_4H_2O_4Cu$ at 30°. (Weiss and Downs, 1923.)

COPPER NITRATE $Cu(NO_3)_2.6H_2O$.

SOLUBILITY OF COPPER NITRATE IN WATER. (Kazantzev, 1923, 1925.)

t°	Gms $Cu(NO_3)_2$ per 100 gms. sat. sol.	Solid Phase.	t°	Gms $Cu(NO_3)_2$ per 100 gms. sat. sol.	Solid Phase.
0	46.3	$Cu(NO_3)_2.6H_2O$	25.5	60.6	$Cu(NO_3)_2.6H_2O$
10	50.3	»	22.5	60.2	»+$Cu(NO_3)_2.3H_2O$
12.5	51.5	»	25	60.3	$Cu(NO_3)_2.3H_2O$
15.0	52.4	»	30	60.9	»
17.5	54.1	»	50	63.5	»
20	55.4	»	75	67.3	»
22.5	57.6	»	100	71.5	»
25.0	60.1	»			

Solubility of Copper Nitrate in Aqueous Solutions of Nitric Acid. (Kazantzev, 1923, 1925.)

Gms. HNO_3 per 100 gms. sat. sol.	Tr. t° of $.6H_2O \rightarrow .3H_2O$.	Gms. $Cu(NO_3)_2$ per 100 gms. sat. sol. at 0°.	10°.	15°.	25°.	50°.	75°.
0.....	25.4	46.3	50.3	52.4	60.3	63.5	67.3
5.....	23.2	41.3	45.4	48.2	55.3	59.0	63.0
10.....	21.0	36.5	40.7	44.3	50.5	54.6	58.9
15.....	18.8	31.9	36.6	40.8	45.7	50.1	54.7
20.....	16.6	27.6	32.6	37.7	41.0	45.7	50.4
30.....	12.2	19.7	26.5	30.5	31.9	36.9	41.8
40.....	7.8	14.3	21.0	21.5	23.0	28.2	33.6
50.....	–	11.4	12.2	13.6	15.0	19.8	25.3
60.....	–	–	–	7.2	8.5	12.0	17.5
70.....	–	–	–	2.6	3.6	5.9	11.2
80.....	–	0.3	–	1.2	1.3	3.2	11.7
95.....	–	0.9	–	1.3	1.7	–	–

The figures in the second column show the temperatures below which, in each case, the solid phase is $Cu(NO_3)_2.6H_2O$ and above which, it is $Cu(NO_3)_2.3H_2O$.

Solubility of Copper Nitrate in Aqueous Solutions of Copper Sulfate and Vice Versa (Massink, 1918.)

At 20°. Gms. per 100 gms. sat. sol. $CuSO_4$.	$Cu(NO_3)_2$.	Solid Phase.	At 35°. Gms. per 100 gms. sat. sol. $CuSO_4$.	$Cu(NO_3)_2$.	Solid Phase.
0.0	54.94	$Cu(NO_3)_2.6H_2O$	0.0	60.92	$Cu(NO_3)_2.3H_2O$
1.2	55.28	»	1.27	60.53	»+$CuSO_4.5H_2O$
1.08	55.08	»+$CuSO_4.5H_2O$	1.02	59.11	$CuSO_4.5H_2O$
1.69	40.24	$CuSO_4.5H_2O$	0.70	54.67	»
2.42	34.24	»	0.86	51.90	»
7.77	11.51	»	1.62	43.10	»
17.52	0.0	»	11.04	11.37	»
			21.00	0.0	»

Solubility of Copper Nitrate in Aqueous Solutions of Sodium Nitrate at 20° and Vice Versa. (Massink, 1918.)

Gms. per 100 gms. sat. sol. $NaNO_3$.	$Cu(NO_3)_2$.	Solid Phase.	Gms. per 100 gms. sat. sol. $NaNO_3$.	$Cu(NO_3)_2$.	Solid Phase.
0.0	55.94	$Cu(NO_3)_2.6H_2O$	43.50	3.38	$NaNO_3$
2.07	55.76	»	46.80	0.0	»
4.29	54.34	»	1.98	57.0	$Cu(NO_3)_2.3H_2O$*
5.27	53.30	»+$NaNO_3$	3.59	57.0	» *
8.19	46.32	$NaNO_3$	5.66	56.57	»+$NaNO_3$*
19.89	29.25	»			

*Unstable.

COPPER SULFATE $CuSO_4.5H_2O$.

Solubility of Copper Sulfate in Water. (Agde and Barkholt, 1926.)

t°.	d_4 of sat. sol.	Gms. $CuSO_4.5H_2O$ per 100 gms. sat. sol.	t°.	d_4 of sat. sol.	Gms. $CuSO_4.5H_2O$ per 100 gms. sat. sol.
– 1.4.....	1.146	19.85	60.0.....	1.343	44.36
+ 0.5.....	1.149	20.15	70.0.....	1.398	50.13
10.0.....	1.176	23.40	80.0.....	1.433	54.52
20.0.....	1.198	26.60	93.0.....	1.504	61.30
30.0.....	1.232	30.55	96.0.....	1.521	63.25
40.0.....	1.262	34.78	100.0.....	1.550	65.92
50.0.....	1.299	39.38			

The freezing-point of a 0.1 normal aqueous $CuSO_4$ solution is — 0.209°; that of a 0.25 normal solution is — 0°.469 and of a 0.5 normal solution it is — 0°.859. (Klein and Svanberg, 1920-1921.)

EQUILIBRIUM IN THE SYSTEM COPPER OXIDE, SULFUR TRIOXIDE AND WATER AT 25°. (Britton, 1925.)

Quantities of amorphous basic sulfate of copper were suspended in aqueous solutions containing different amounts of copper sulfate and sulfuric acid. The mixtures were kept in a thermostat and shaken daily for about a week and the solutions and air dried solid phases were analyzed. After an additional period of 2 to 3 months they were again analyzed. Less than a week was sufficient for equilibrium. In the most basic part of the isotherm it was necessary to use hydrated copper oxide. The terms in which the results are expressed are not clearly defined.

Liquid Phase.			Liquid Phase.		
% CuO.	% SO_3.	Solid Phase.	% CuO.	% SO_3.	Solid Phase.
0.0	0.0	$4CuO.SO_3.4H_2O$+CuO (hydrated)	3.17	3.19	$4CuO.SO_3.4H_2O$
0.02	0.02	$4CuO.SO_3.4H_2O$	5.54	5.56	»
0.09	0.09	»	7.17	7.18	»
0.12	0.12	»	9.28	9.33 (Eutec.)	» +$CuSO_4.5H_2O$
0.58	0.58	»			

COPPER Ammonium SULFATE $CuSO_4.(NH_4)_2SO_4.6H_2O$.

SOLUBILITY OF MIXED CRYSTALS OF COPPER AMMONIUM SULFATE AND OF COBALT AMMONIUM SULFATE IN WATER : (Bertisch, 1926.)

at 0°.				at 8°.			
	Gms. per 1000 cc. sat. sol.				Gms. per 1000 cc. sat. sol.		
d of sat. sol.	$CuSO_4.(NH_4)_2SO_4.6H_2O$	$CoSO_4.(NH_4)_2SO_4.6H_2O$	Wt. per cent $CuSO_4.(NH_4)_2SO_4.6H_2O$ in Solid Phase.	d of sat. sol.	$CuSO_4.(NH_4)_2SO_4.6H_2O$	$CoSO_4.(NH_4)_2SO_4.6H_2O$	Wt. per cent $CuSO_4.(NH_4)_2SO_4.6H_2O$ in Solid Phase.
1.0931	162.82	0.00	100.00	1.1112	197.62	0.00	100.00
1.0905	138.11	15.70	85.73	1.1094	178.04	12.09	90.57
1.0886	127.89	22.56	75.87	1.1059	157.65	28.44	81.56
1.0863	110.93	35.53	67.10	1.1027	144.14	34.93	74.09
1.0836	92.28	49.49	56.78	1.0985	120.61	51.75	63.59
1.0809	80.87	56.92	47.14	1.0960	96.99	69.22	51.24
1.0758	50.70	77.68	30.86	1.0923	82.50	77.75	42.09
1.0687	16.14	101.36	9.94	1.0846	40.45	105.76	22.71
1.0646	0.00	111.65	0.00	1.0757	27.76	112.79	14.32
				1.0757	0.00	130.78	0.00

SOLUBILITY OF MIXED CRYSTALS OF COPPER AMMONIUM SULFATE AND OF IRON AMMONIUM SULFATE IN WATER : (Haber-Chuwis, 1926.)

at 0°.				at 8°.2.			
	Gms. per 1000 cc. sat. sol.				Gms. per 1000 cc. sat. sol.		
d of sat. sol.	$CuSO_4.(NH_4)_2SO_4.6H_2O$	$FeSO_4.(NH_4)_2SO_4.6H_2O$	Mol. per cent $CuSO_4.(NH_4)_2SO_4.6H_2O$ in Solid Phase.	d of sat. sol.	$CuSO_4.(NH_4)_2SO_4.6H_2O$	$FeSO_4.(NH_4)_2SO_4.6H_2O$	Mol. per cent $CuSO_4.(NH_4)_2SO_4.6H_2O$ in Solid Phase.
1.1020	163.92	0.00	100.00	1.1178	197.58	0.00	100.0
1.1032	151.88	18.17	92.82	1.1202	173.56	31.95	89.43
1.1069	131.14	47.52	82.40	1.1245	160.29	52.61	81.77
1.1105	110.43	78.30	69.63	1.1287	141.70	79.28	72.65
1.1175	93.50	104.30	59.30	1.1331	119.77	110.95	59.83
1.1218	79.41	125.98	49.08	1.1366	98.70	140 93	48.80
1.1260	61.39	153.09	37.91	1.1410	62.44	191.76	31 64
1.1369	34.49	199.69	20.12	1.1448	50.42	208.84	25.47
1.1392	0.00	245.32	0.00	1.1495	32.07	233.63	16.58
				1.1538	17.03	256.05	8.78
				1.1562	0.00	279.68	0.00

Solubility of Mixed Crystals of Copper Ammonium Sulfate and of Manganese Ammonium Sulfate in Water at 7°. (Bertisch, 1926.)

d of sat. solut.	Gms. per 1000 cc. sat. solution: $CuSO_4(NH_4)_2SO_4.6H_2O$	Gms. per 1000 cc. sat. solution: $MnSO_4.(NH_4)_2SO_4.6H_2O$	$CuSO_4.(NH_4)_2SO_4.6H_2O$ in Solid Phase: Wt. per cent.	$CuSO_4.(NH_4)_2SO_4.6H_2O$ in Solid Phase: Mol. per cent.
1.1129	192.36	0.00	100.00	100.00
1.1179	162.83	43.93	93.28	93 15
1.1 43	143.75	81.27	85.23	84.96
1.1349	116.69	126.64	75.93	75.53
1.1430	90.77	170.59	63. 6	62.76
1.1576	68.58	232.19	53.37	52.83
1.1684	38.55	281.70	35.40	34.90
1.1787	28.39	312.03	24.68	24.28
1.1889	0.00	382.80	0 00	0.00

Solubility of Mixed Crystals of Copper Ammonium Sulfate and of Nickel Ammonium Sulfate in Water : (Ostersetzer, 1926.)

at 0°.				at 8°.			
	Gms. per 1000 cc. sat. sol.				Gms. per 1000 cc. sat. sol.		
d of sat. sol.	$CuSO_4.(NH_4)_2SO_4.6H_2O$.	$NiSO_4.(NH_4)_2SO_4.6H_2O$.	Wt. per cent $CuSO_4.(NH_4)_2SO_4.6H_2O$ in Solid Phase.	*d* of sat. sol.	$CuSO_4.(NH_4)_2SO_4.6H_2O$.	$NiSO_4.(NH_4)_2SO_4.6H_2O$.	Wt. per cent $CuSO_4(NH_4)_2SO_4.6H_2O$ in Solid Phase.
1.0954	161.71	0.00	100.00	1.1115	195.74	0.00	100.00
1.0813	125.86	11.59	77 84	1.0937	150.12	13.25	76 70
1.0765	113.89	15.43	69.09	1.0869	126.21	22.98	62.40
1.0703	99.25	18.33	58.91	1.0784	110.71	23.47	52.36
1.0639	85.89	19.77	48.25	1.0687	88.64	30.43	41.49
1.0576	70.52	24.21	38.71	1.0631	70.23	37.70	32.23
1.0480	51.42	32.69	28.55	1.0574	47.84	49.17	21.97
1.0434	36.77	35 06	19.39	1.0506	33.65	51.74	15.25
1.0334	0.00	54.73	0.00	1.0457	17.13	58.27	7.54
				1.0404	0.00	67.13	0.00

Solubility of Mixed Crystals of Copper Ammonium Sulfate and of Zinc Ammonium Sulfate at 6°.8. (Halpern, 1926.)

d of sat. sol.	Gms. per 1000 cc. sat. sol. $CuSO_4(NH_4)_2SO_4.6H_2O$.	Gms. per 1000 cc. sat. sol. $ZnSO_4.(NH_4)_2SO_4.6H_2O$.	Wt. per cent $CuSO_4(NH_4)_2SO_4.6H_2O$ in Solid Phase.
1.1090	191.90	0.00	100.00
1.1033	158.06	22.27	83.24
1.0942	120.93	43 85	59.51
1.0934	108.48	50.64	52.28
1.0887	87.92	63.22	42.62
1.0847	69.82	73.62	32.36
1.0804	44.59	92.31	21.36
1.0755	11 09	113.69	6.11
1.0725	0.00	121.14	0.00

In the case of the above pairs of salts the crystals mix in all proportions and the curves of their solubilities are continuous. The results confirm the proportionality between the solubility and the chemical composition of the mixed crystals. The solubility of the mixed crystals is a linea function of the solubilities of the single salts and the of molecular proportion in which they mix.

Solubility of Copper Sulfate in Aqueous Solutions of Ferrous Sulfate and Vice Versa. (Agde and Barkholt, 1926.)

Results at 25°.

d of sat. sol.	Gms. per 100 gms. sat. sol. $CuSO_4.5H_2O$.	Gms. per 100 gms. sat. sol. $FeSO_4.7H_2O$.
1.256	28.64	5.03
1.275	28.87	7.08
1.320	28.26	12.46
1.320	27.44	15.09
1.343	27.62	17.65
1.314	23.23	18.68
1.308	22.09	20.28
1.308	19.78	23.05
1.305	19.84	22.29
1.300	14.96	27.56
—	14.64	28.40
1.291	12.18	29.84
1.289	10.76	31.39
1.275	5.52	36.29
1.266	3.88	37.45

Results at 56°.

d of sat. sol.	Gms. per 100 gms. sat. sol. $CuSO_4.5H_2O$.	Gms. per 100 gms. sat. sol. $FeSO_4.7H_2O$.	Solid Phase at both temperatures.
1.357	41.92	4.50	$CuSO_4.5H_2O$
1.383	41.61	6.28	»
1.408	41.10	10.12	»
1.469	41.24	17.90	»
1.537	39.31	26.55	»
1.512	31.15	34.07	$FeSO_4.7H_2O$
1.505	27.62	37.92	»
1.482	21.25	43.49	»
1.472	19.52	45.00	»
1.477	19.81	45.04	»
1.470	15.01	50.31	»
1.460	11.95	52.95	»
1.450	10.73	54.65	»
1.457	5.35	60.21	»
1.437	3.80	60.48	»

Similar determinations are also given at 10°, 15°, 20°, 30°, 35° and 40°. Saturation was, in general, approached from above. The mixtures were stirred constantly and protected from the air by means of a mercury seal.

Solubility of Copper Sulfate in Aqueous Solutions of Potassium Sulfate and Vice Versa. (Caven and Mitchell, 1924.)

The mixtures were kept in a thermostat and shaken intermittently. The solutions were analyzed repeatedly untill concordant results were obtained.

Results at 25°.

Mols. per 100 gms. H_2O. $CuSO_4$.	K_2SO_4.	Solid Phase.	Mols. per 100 gms. H_2O. $CuSO_4$.	K_2SO_4.	Solid Phase.
0.1410	0.00	$CuSO_4.5H_2O$	0.0955	0.0270	1.1.6
0.1415	0.0014	»	0.0365	0.0331	»
0.1430	0.0037	»	0.0350	0.0350	»
0.1457	0.0086	»	0.0237	0.0412	»
0.1477	0.0110	»	0.0120	0.0598	»
0.1504	0.0150	»	0.0092	0.0737	»+K_2SO_4
0.1570	0.0225	»+1.1.6	0.0060	0.0708	K_2SO_4
0.1525	0.0228	1.1.6	0.0000	0.0661	»
0.1145	0.0261	»			

Results at 51°.

Mols. per 100 gms. H_2O. $CuSO_4$.	K_2SO_4.	Solid Phase.
0.2073	0.00	$CuSO_4.5H_2O$
0.2266	0.0618	»+1.1.6
0.0677	0.0706	1.1.6
0.0312	0.1036	»+K_2SO_4
0.0000	0.0923	K_2SO_4

Results at 61°.

Mols. per 100 gms. H_2O. $CuSO_4$.	K_2SO_4.	Solid Phase.
0.2419	0.00	$CuSO_4.5H_2O$
0.2586	0.0838	»+1.1.6
0.0728	0.0932	1.1.6
0.0422	0.1187	»+K_2SO_4
0.000	0.1064	K_2SO_4

1.1.6 = $CuSO_4.K_2SO_4.6H_2O$.

Solubility of Mixed Crystals of Copper Potassium Sulfate and Cobalt Potassium Sulfate in Water.

(Ploin, 1926.)

Results at 0°.

d of sat. sol.	Gms. per 1000 cc. sat. sol. $CuSO_4.K_2SO_4.6H_2O$.	Gms. per 1000 cc. sat. sol. $CoSO_4.K_2SO_4.6H_2O$.	Wt. per cent $CuSO_4.K_2SO_4.6H_2O$ in Solid Phase.
1.0462	67.67	0.00	100.00
1.0488	58.33	13.46	89.04
1.0524	53.71	22.09	81.60
1.0538	46.32	33.30	69.67
1.0566	39.48	44.15	58.74
1.0601	31.19	56.68	49.46
1.0612	25.43	65.31	40.85
1.0673	11.40	87.06	21.41
1.0719	0.00	106.81	0.00

Results at 7°.8.

d of sat. sol.	Gms. per 1000 cc. sat. sol. $CuSO_4.K_2SO_4.6H_2O$.	Gms. per 1000 cc. sat. sol. $CoSO_4.K_2SO_4.6H_2O$.	Wt. per cent $CuSO_4.K_2SO_4.6H_2O$ in Solid Phase.
1.0587	85.99	0.00	100.00
1.0617	74.48	17.21	87.78
1.0639	66.14	29.49	79.89
1.0668	56.02	44.02	70.84
1.0703	46.92	58.54	59.53
1.0730	37.08	73.90	47.13
1.0760	32.18	82.36	41.27
1.0796	25.30	94.53	29.75
1.0825	14.59	110.20	20.40
1.0852	5.90	124.47	9.56
1.0879	0.00	133.80	0.00

Solubility of Mixed Crystals of Copper Potassium Sulfate and Nickel Potassium Sulfate.

(Halpern. 1926.)

Results at 0°.

d of sat. sol.	Gms. per 1000 cc. sat. sol. $CuSO_4.K_2SO_4.6H_2O$.	Gms. per 1000 cc. sat. sol. $NiSO_4.K_2SO_4.6H_2O$.	Wt. per cent $CuSO_4.K_2SO_4.6H_2O$ in Solid Phase.
1.0466	70.71	0.00	100.00
1.0456	65.45	3.04	88.88
1.0454	57.00	9.43	77.98
1.0433	53.04	11.52	69.02
1.0434	45.85	15.83	54.56
1.0395	37.39	21.37	45.22
1.0393	27.89	28.50	32.39
1.0357	14.70	37.64	14.05
1.0224	0.00	48.07	0.00

Results at 8°.5.

d of sat. sol.	Gms. per 1000 cc. sat. sol. $CuSO_4.K_2SO_4.6H_2O$.	Gms. per 1000 cc. sat. sol. $NiSO_4.K_2SO_4.6H_2O$.	Wt. per cent $CuSO_4.K_2SO_4.6H_2O$ in Solid Phase.
1.0582	92.12	0.00	100.00
1.0281	79.73	6.47	80.46
1.0563	69.71	13.53	71.41
1.0521	60.13	20.53	61.12
1.0547	55.38	21.29	47.98
1.0496	43.51	29.61	39.83
1.0472	35.60	33.79	29.34
1.0426	24.46	39.13	21.07
1.0451	15.36	47.85	12.32
1.0397	0.00	60.18	0.00

Solubility of Mixed Crystals of Copper Potassium Sulfate and Zinc Potassium Sulfate at 6°.8. (Ploin 1926.)

d of sat. sol.	Gms. per 1000 cc. sat. sol. $CuSO_4.K_2SO_4.6H_2O$.	Gms. per 1000 cc. sat. sol. $ZnSO_4.K_2SO_4.6H_2O$.	Wt. per cent $CuSO_4.K_2SO_4.6H_2O$ in Solid Phase.
1.0581	85.32	0.00	100.00
1.0595	75.83	12.11	87.82
1.0620	68.79	22.53	77.17
1.0634	58.14	34.58	66.05
1.0644	49.28	45.55	55.55
1.0658	42.93	54.10	45.64
1.0672	33.40	65.60	36.81
1.0682	24.74	75.91	27.64
1.0690	16.99	84.80	18.69
1.0707	0.00	106.08	0.00

The above pairs of crystals mix in all proportions and the curves of solubility are continuous. The results confirm the proportionality between the solubility and the chemical composition of the mixed crystals.

SOLUBILITY OF COPPER SULFATE IN AQUEOUS SOLUTIONS OF SODIUM SULFATE AT 20° AND VICE VERSA. (Massink, 1918.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$CuSO_4$.	Na_2SO_4.	Solid Phase.	$CuSO_4$.	Na_2SO_4.	Solid Phase.
0.0	16.25	$Na_2SO_4.10H_2O$	15.54	11.85	1.1.2+$CuSO_4.5H_2O$
5.69	15.99	»	16.51	6.09	$CuSO_4.5H_2O$
11.22	15.45	» +1.1.2	17.52	0.0	»
13.30	13.78	1.1.2	1.1.2 = $CuSO_4.Na_2SO_4.2H_2O$		

Data for the system $CuSO_4 + Cu(NO_3)_2 + Na_2SO_4 + NaNO_3 + H_2O$ at 20°, are also given.

SOLUBILITY OF COPPER SULFATE IN AQUEOUS SOLUTIONS OF SULFURIC ACID AT 25°. (Goodwin and Horsch, 1919.)

$d_{\frac{25}{4}}$ of sat. sol.	Gram. Equivalents per liter.		$d_{\frac{25}{4}}$ of sat. sol.	Gram. Equivalents per liter.	
	$CuSO_4$.	H_2SO_4.		$CuSO_4$.	H_2SO_4.
1.2140.....	2.818	0.0000	1.2165.....	2.181	1.876
1.2105.....	2.784	0.1488	1.2162.....	2.153	1.914
1.2070.....	2.634	0.4208	1.2229.....	1.837	3.077
1.2115.....	2.457	0.8680	1.2267.....	1.649	3.659
1.2130.....	2.320	1.3450			

SOLUBILITY OF COPPER SULFATE IN AQUEOUS SOLUTIONS OF SULFURIC ACID. (Foote, 1919.)

Results at 12°.

Gms. per 100 gms. sat. sol.		
$CuSO_4$.	H_2SO_4.	Solid Phase.
16.15	0.0	$CuSO_4.5H_2O$
1.67	51.5	» +$CuSO_4.3H_2O$
0.81	61.54	$CuSO_4.H_2O$ + »

Results at 25°.

Gms. per 100 gms. sat. sol.		
$CuSO_4$.	H_2SO_4.	Solid Phase.
18.44	0.0	$CuSO_4.5H_2O$
2.83	49.20	» +$CuSO_4.3H_2O$
2.13	55.72	$CuSO_4.H_2O$ + »

100 gms. aqueous solution saturated simultaneously with $CuSO_4.5H_2O$ and $Na_2SO_4.10H_2O$ at 12° contain 14.60 gms $CuSO_4$ + 10.43 gms. Na_2SO_4.

Data for the system $CuSO_4 + Na_2SO_4 + H_2SO_4 + H_2O$ at 12° and at 25° are also given.

COPPER SULFIDE Cu_2S.

Fusion point and other data for the system Cu_2S and FeS are given by Carpenter and Haywood, 1923.

COPPER Benzene and Naphtalene SULFONATES.

SOLUBILITY OF EACH SEPARATELY IN WATER. (Ephraim and Seger, 1925.)

Results for Copper Benzene Sulfonate.

t°.	Gms. $Cu(C_6H_5SO_3)_2$ per 100 cc. sat. sol.	Solid Phase.
18.....	32.33	$Cu(C_6H_5SO_3)_2.6H_2O$
34.....	39.26	»
49.5...	49.70	»
50.0...	48.89	$Cu(C_6H_5SO_3)_2.9H_2O$
64.5...	55.92	»
80.5 ..	66.24	»

Results for Copper Naphtalene-2-Sulfonate.

t°.	Gms. $Cu(C_{10}H_7SO_3)_2$ per 100 cc. sat. sol.	Solid Phase.
20.....	1.07	$Cu(C_{10}H_7SO_3)_2.6H_2O$
32.....	1.49	»
45.....	2.26	»
59.....	3.80	»
74.....	6.54	»
82.....	9.42	»

SOLUBILITY OF SEVERAL COPPER SULFONATES IN WATER.

Compound.	Formula.	t°.	Gms. anhydrous cmpd. per 100 cc. sat. sol.
Copper Anthracene –1–sulfonate	$Cu(C_{14}H_9SO_3)_2.6H_2O$	20	0.0806 (1)
» » –2– »	$Cu(C_{14}H_9SO_3)_2$ –	20	0.0083 (1)
» Naphthalene–1– »	$Cu(C_{10}H_7SO_3)_2.6H_2O$	17	4.647 (2)
» » –6–oxy–2– »	$Cu(C_{10}H_7SO_3)_2.7H_2O$	20	1.249 (1)
» » –5–chlor–1– »	$Cu(C_{10}H_6SO_3Cl)_2.4H_2O$	20	1.088 (1)
» –10–Chlorphenanthrene–3 or 6– »	$Cu(C_{14}H_8ClSO_3)_2.4H_2O$	20	0.010 (3)

(1) Ephraim and Pfister, 1925*a*. (2) Ephraim and Seger, 1925. (3) Sandquist. 1917.

COPPER TARTRATE $CuC_4O_6H_4.3H_2O$.

100 cc. of aqueous saturated solution of copper tartrate contain 2.3×10^{-4} gm. mols. or 0.061 gms. $CuC_4O_6H_4.3H_2O$ at 18°. (Kolthoff, 1926.)

COPPER Di THIONATE $CuS_2O_6.4H_2O$.

100 gms. sat. solution of copper dithionate in water contain 43.82 gms. CuS_2O_6 at 0°, 44.91 gms. at 20° and 45.51 gms. at 30°. (de Baat, 1926.)

COTTONSEED OIL.

100 gms. anhydrous formic acid dissolve 0.77 gm. cotton seed oil at 25°. (Gordon and Reid, 1922.)

COUMARIN (1.2-Benzopyrone) $C_9H_6O_2$.

100 gms. abs. alcohol dissolve 12.57 gms. Coumarin at 20-25°.
» quinoline » 0.56 » » »
» equi mol. mixture of alcohol and quinoline dissolve 0.8 gm. Coumarin at 20–25°.
(Pucher and Dehn, 1921.)

Solubility of Coumarin in Aqueous Solutions of Glycerol. (de Groote, 1920.)

Note. — The glycerol solutions were prepared by diluting given volumes of C. P. grade 95 % glycerol with water in a 1000 cc. flask. Thus the 5 % gly cerol was prepared by diluting 50 cc. of 95 % glycerol (measured at 20°) to 1000 cc. with water at 20°. The saturated solutions were prepared by adding an excess of coumarin to 500 cc. of solvent at a temperature about 10° higher than that of the determination, and then allowing to stand at the selected temperature, with intermittent shaking, for 72 hours. The saturated solutions were analyzed by extracting the coumarin with ether. The ethereal extract was evaporated and the residue dissolved in water and again extracted with ether. The residue of purified coumarin was dried at 30° and weighed. The curves given by the results are not as smooth as is desirable.

Per cent of 95 % glycerol in solvent.	Gms. Coumarin per 100 cc. sat. solution at 0°2.	20°.	30°.	40°.	50°.	60°.
0.0 (= H_2O)	0.09	0.19	0.26	0.45	0.65	0.70
5.0	0.10	0.20	0.28	0.47	0.68	0.80
10.0	0.12	0.22	0.31	0.50	0.72	0.88
15.0	0.13	0.24	0.36	0.55	0.78	0.98
20.0	0.14	0.26	0.38	0.56	0.85	1.09
25.0	0.14	0.28	0.43	0.60	0.92	1.17
30.0	0.15	0.30	0.47	0.65	1.03	1.30
40.0	0.19	0.37	0.55	0.77	1.16	1.75
50.0	0.28	0.50	0.68	0.92	1.46	2.20

CREATININE PICRATE $C_4H_7N_3O.OHC_6H_2(NO_2)_3$.

100 gms. sat. solution in water contain 0.122 gm. picrate at 7°.5, 0.182 gm. at 21°, 0.263 gm. at 32.5°, 0.416 gm. at 48.0°, 1.035 gm. at 78° and 1.572 gm. at 92°.
100 gms. sat. solution in aq. 50 % ethyl alcohol contain 0.224 gm. picrate at 8°, 0 362 gm. at 19°, 0.753 gm. at 37°, 1.718 gm. at 57° and 3.106 gm. at 74°. (Medes, 1925-1926.)

CRESOLS $CH_3.C_6H_4.OH$ *o*, *m* and *p*.

Reciprocal Solubility of Ortho Cresol and Ethyl Alcohol, Determined by the Freezing-Point Method. (Perrakis, 1925.)

t° of Crystallization.	Mol. per cent *o* $CH_3.C_6H_4.OH$ in sat. sol.	t° of Crystallization.	Mol. per cent *o* $CH_3.C_6H_4.OH$ in sat. sol.
29.05	100.00	1.70	71.10
22.60	91.31	— 4.00	65.84
14.00	83.00	—17.20	56.39
8.30	76.89	—31.00	48.40

Equilibrium in the Systems Cresols, Sodium Oleate and Water.

(Bailey, 1923.)

Especial attention was given to the purification of the sodium oleate. The determinations were made by the synthetic method.

Ortho Cresol + Sodium Oleate + Water at 20°.		Meta Cresol + Sodium Oleate + Water at 20°.		Meta Cresol + Sodium Oleate + Water at 60°.		Para Cresol + Sodium Oleate + Water at 20°.	
Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
Cresol.	Oleate.	Cresol.	Oleate	Cresol.	Oleate.	Cresol.	Oleate.
2.8	–	2.4	–	3.0	–	2.0	–
7.5	2.3	5.2	1.2	6.6	1 3	7.5	1.7
10.5	3.7	11.0	3.5	10.5	2.6	12.1	2.9
31.3	8.5	16.0	5.2	22.5	5.1	17.2	4.1
49.5	8.5	23.6	7.2	30.7	6.2	35.6	7.2
67.3	7.4	36.4	9.1	48.6	8.6	38.9	7.6
75.5	5.6	42.6	11.0	54.3	10.2	48.8	9.1
80.6	3.5	45.1	13.3	63.3	9 2	62.4	9.0
84.0	1.3	52.8	14.1	71.0	6.6	71.0	6.2
85.1	0.7	61.6	12.2	79.6	2.2	76.4	4.1
85.7	0.4	71.4	8.3	82.0	0.9	80.3	2.5
86.0	0.3	81.2	3.7	82.7	0.5	81.8	1.8
86.4	–	84.9	1.9	83.4	–	85.2	–
		87.2	–				

Freezing-point lowering data (solubilities, see foot note, p. 1001) are given for the following mixtures :

o	Cresol + *p* Cresol	(Hill and Mosbacher, 1925; Hill and Davis, 1926; Dawson and Mountford, 1918; Fox and Barker, 1918.)
o	» + *m* »	(Dawson and Mountford, 1918; Fox and Barker, 1918.)
m	» + *p* »	» »
o, *m* and *p*	» + Phenol	(Dawson and Mountford, 1918, Fox and Barker, 1918; Fischer and Gröppel, 1917.)
o	» + Naphthalene	(Rhodes and Hance, 1921.)
Trinitro *m*	» + Picric acid	(Quist, 1924.)

Dawson and Mountford, 1918, show that the freezing-point measurements may be utilized for the complete determination of the composition of the binary and ternary mixtures of cresols and phenol. In the case of quaternary mixtures the application of the freezing-point methods is preceded by a fractionation process.

Fischer and Gröppel, 1917, also use the freezing-point measurements for the analysis of unknown mixtures.

CROTONIC ACIDS $\alpha = CH_3.CH : CH\,COOH$, $\beta = HCH_3C : CH\,COOH$.

Distribution of α Crotonic Acid at 25° Between : (Smith, 1921-1922.)

Water and Chloroform. Millimols. per liter			Water and Ether. Millimols. per liter			Water and Xylene. Millimols. per liter		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
2.35	0.75	0.319	0.54	1.70	3.15	4.75	0.55	0.115
3.55	1.30	0.366	0.85	2.73	3.21	6.3	0.80	0.127
5.10	2.125	0 417	1.24	3.92	3.16	13.9	2.50	0.180
7.15	3.40	0.475	1.68	5.48	3.26			
			3.52	11.6	3.30			

Solubility of Crotonic Acids in Several Solvents. (Lebrun. 1925.)

Compound.	Solvent.	t°.	Gms. cmpd. per 100 gms. solvent.
Crotonic acid.	Brombutene (b. pt. 93°.9)	0	8.62
Iso »	» »	0	100.0+
β Chlor »	» »	0	1.46
» » Iso »	» »	0	16.96
Crotonic acid.	Brombutene (b. pt. 85°.5)	0	7.88
Iso »	» »	0	100.0+
β Chlor »	» »	0	1.15
» » Iso »	» »	0	17.30
Crotonic acid.	Dichlor acetylene (cis) (b. pt. 60°.2)	0	20.83
Iso »	» » »	0	100.0+
β Chlor »	» » »	0	5.75
» » Iso »	» » »	0	32.20
» » » »	» » »	39	3.11
Crotonic acid.	Dichlor acetylene (trans) (b. pt. 48°.3)	0	17.12
Iso »	» » »	0	100.0+
β Chlor »	» » »	0	2.36
» » Iso »	» » »	0	37.29
» » » »	» » »	39	1.64
» » »	Ethyl chlor iso crotonate	20	58.1
» » »	» » » »	20	8.93

CRYPTOPINE PICRATE $C_{21}H_{23}NO_5.HO.C_6H_2(NO_2)_3$ (m. pt. 161°–3°).

100 gms. sat. solution in water contain 0.007 gm. of the compound at 15°.
» » C_2H_5OH » 0.022 » » » »
» » acetone » 0.162 » » » »

(Maplethorpe and Evers, 1925.)

Pseudo **CUMENE** $C_6H_3(CH_3)_2$ (b. pt. 168°–2°).

Freezing-point data for mixtures of $C_6H_3(CH_3)_3 + SO_2$ are given by De Carli, 1926.

CUPREINE SULFATE.

A sample twice recrystallized from H_2O gave a solubility of $1.855.10^{-3}$ normal or 0.666 gm. anhydrous cupreine sulfate per liter at 18°. The sat. solution had a p_H of 5.8. The dissociation constant was $K_1 = 2.7.10^{-7}$. (Kolthoff, 1925.)

CYANURIC TRIAZIDE.

100 gms. glycol diacetate ($CH_3.CO\,O.CH_2.CH_2.O\,OC.CH_3$), b. pt. 188°-189°.6; dissolve less than 0.9 gm. cyanuric triazide at 25°. (Taylor and Rinkenbach, 1926.)

DiCYANODIAMIDE $(H_2CN_2)_2$ (Polymerized cyanamide).

Solubility in Water, in Alcohol and in Ether.
(Hetherington and Braham, 1923.)

In Water.

t°.	Gms. $(H_2CN_2)_2$ per 100 gms. H_2O.
0.....	1.27
13.....	2.26
15.....	2.56
25.....	4.13
39.9.....	7.76
49.8.....	11.80
60.1.....	18.75
74.5.....	32.58–33.41

In Ethyl Alcohol ($d_{\frac{20}{4}} = 0.790$).

t°.	Gms. (H_2CN_2) per 100 gms. Alcohol.
0.....	0.937
13.0.....	1.26
26.4.....	1.70
35.0.....	2.26
49.9.....	3.30
60.1.....	4.13

In Ethyl Ether (dried over Na).

t°.	Gms. $(H_2CN_2)_2$ per 100 gms. Ether.
0.....	0.0006
13.0.....	0.01*
25.0.....	0.0015
35.3.....	0.0026

* Pohl, *J. prakt. Chem.* [2]. 77, 534, 1908.

CYCLOHEXANE (Hexamethylene, Hexahydrobenzene) $CH_2<(CH_2.CH_2)_2>CH_2$.

THE MUTUAL SOLUBILITY OF CYCLOHEXANE AND METHYL ALCOHOL.
(Timmermans, 1912.)

The following determinations of the critical temperature of solution at high pressures are given. The constants of the cyclohexane were : b. pt. 80°.75; f. pt. + 6°.5. The methyl alcohol was rendered anhydrous by distilling over sodium.

Pressure in kilogm.	Critical temp. of solution.	Pressure in kilogm.	Critical temp. of solution.
50.....	59.45	400.....	69.10
100.....	61.02	700.....	75.26
200.....	63.98	1000.....	81.0

The triphase system crystallizes at + 5°.

RECIPROCAL SOLUBILITY OF CYCLOHEXANE AND LIQUID SULFUR DIOXIDE.
(Seyer and Dunbar, 1922.)

The cyclohexane had a boiling point of 79° and freezing-point of + 6.4. It was dried by refluxing over sodium. The SO_2 was the ordinary commercial product carefully freed of H_2O. Weighed amounts of the two constituents were sealed in bulbs of about 15 cc. capacity and the temperatures at which two distinct layers or cyclohexane crystals just appear, were determined.

Solubility of the Two Liquids.

t°.	Wt. per cent SO_2.	t°.	Wt. per cent SO_2.
— 1.0...	18.0	13.3...	65.4
+ 1.5...	22.0	8.8...	83.2
11.0...	35.0	4.0...	87.9
11.3...	40.9	—6.0...	92.2
13.5...	59.2	—8.5...	94.0

Temperatures at Which Cyclohexane Crystals Appear.

t°.	Wt. per cent SO_2.	t°.	Wt. per cent SO_2.
— 4.3...	4.0	About —51.0...	98.4
—17.0...	18.0	—56.0...	99.0
—17.0...	22.0	—60.0...	99.2
—24.3...	96.0	—60.45...	99.5
—34.2...	97.5	—72.5 (Eutectic)	—

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given for the following systems :

Cyclohexane + Naphthalene (Linard, 1925.)
» + *p* Toluidine »
» + *o* » (Hortenberg, 1926.)
» + *m* » (Dessart, 1926.)
» + Propionitrile (Hortenberg, 1926.)
» + *m* Nitrotoluene (Dessart, 1926.)
» + *p* » (Linard, 1925.)

Methyl cyclohexane + *o* Toluidine (Hortenberg, 1926.)
» + *m* Toluidine (Dessart, 1926.)
» + *m* Nitrotoluene (Dessart, 1926.)
» + HBr (Maass, Boomer and Morrison, 1923.)

The critical solution temp of cyclohexane + propionitrile is 12°.2 and the mixture contains 70 per cent of cyclohexane. (Hortenberg, 1926.)

The critical solution temp of methylcyclohexane and *o* toluidine is — 5°.6 and the mixture contains 45.5 per cent methyl cyclohexane. (Hortenberg, 1926.)

Numerical data are given by Dessart, 1926, for the curve of separation in the system methyl cyclohexane + *m* toluidine.

CYMENE $C_6H_4(CH_3)(C_3H_7)$.

F. pt. data for mixtures of cymene and SO_2 are given by De Carli, 1926.

CYMENE DISULFONAMIDE $C_{10}H_{12}(SO_2.NH_2)_2$.

100 gms. of ether dissolve 0.0727 gm. cymene disulfonamide at 25°. (Phillips, 1924.)

This author also gives f. pt. data for the system α cymene sulfonamide + β cymene sulfonamide.

CYSTINE *l* $C_{14}H_{14}N_2O$.

100 cc. sat. sol. of cystine in water contain 0.0168 gm. $C_{14}H_{14}N_2O$ at 21°.
» » in 0.02 mol. $(NH_4)_2SO_4$ » 0.0054 » »

The method followed by Pfeiffer and Angern, 1924, in making the above determinations is described under Alanine, p. 1019.

Solubility of Cystine in Various Aqueous Solutions of Different Hydrogen Ion Concentration at 25°. (Sano, 1926.)

The desired p_H value of the solution was always secured with only such acids and bases as form easily soluble salts with the amino acid. In all cases the solid phase was the amino acid. A large excess of cystine was shaken at 25° with the solvent and the sat. solution, after filtration, was used for the determination of p_H by means of the hydrogen electrode and of the dissolved amino acid by a nitrogen determination.

Solvent.	p_H of sat. sol.	Gms. N per liter sat. sol.	Solvent.	p_H of sat. sol.	Gms. N per liter sat. sol.
Aq. 0.333 *n* HCl.....	0.83	1.565	Aq. 0.1 *n* CH_3COOH		
» 0.100 » »	1.15	0.3861	+2.0 *n* CH_3COONa...	5.88	0.0135
» 0.020 » »	1.70	0.05275	Aq. 0.333 mol. sec. phosphate		
» 0.010 » »	2.10	0.02770	+0.333 » prim. »	7.52	0.0193
» 5.0 *n* CH_3COOH			Aq. 0.33 mol. sec. phosphate.	7.98	0.0276
+0.10 *n* CH_3COONa..	2.99	0.01310	» 0.005 *n* NaOH ...	8.55	0.0623
Aq. 1.0 *n* CH_3COOH			» 0.01 » » ...	8.78	0.1017
+0.20 *n* CH_3COONa..	3.76	0.01278	» 0.02 » » ...	9.05	0.1924
Aq. 0.1 *n* CH_3COOH			» 0.10 » » ...	9.85	1.4590
+0.1 *n* CH_3COONa...	4.59	0.01310			

The solubility minimum is at p_H 3.76 and the sat. solution contains 0.01278 gm. N, corresponding to 0.1097 gm. cystine.

DECALIN (Decahydronaphtalene) $C_{10}H_{18}$.

Solubility in Liquid Sulfur Dioxide (98.85 % SO_2).
(Zerner, Weisz and Opalski, 1922.)

The determinations were made in sealed resistance glass tubes. Weighed amounts of the constituents were introduced and the temperatures determined at which homogeneous mixing or slight clouding occurred. The Decalin had a corrected b. pt. of 188-189°. It had $d_{20} = 0.8857$ and $n\frac{15°}{D} = 1.4753$.

t° of solution.	Gms. $C_{10}H_{18}$ per 100 gms. sat. sol.	t° of solution.	Gms. $C_{10}H_{18}$ per 100 gms. sat. sol.
−14.5.....	1.62	38.0.....	13.80
+ 0.5.....	2.86	50.75.....	27.34
18.0.....	5.53	51.50.....	52.48
28.5.....	9.72	22.25.....	81.39

DIBENZYL $C_6H_5.CH_2.CH_2.C_6H_5$.

Freezing-point data for mixtures of dibenzyl and picric acid and of dibenzyl and styphnic acid are given by Efremov, 1919; 1919 *a*.

DILACTONE $C_{10}H_{12}O_8$.

Solubility of Dilactone in Water. (Feofilaktow, 1926.)

Dilactone is the product of aldol condensation of two molecules of α Oxo-β-methyl-γ-butyrolactone. The author does not state the exact terms in which the results are given but it is probable that the figures refer to the grams of lactone per 100 gms. of water.

t°.....	0°.	25°.	50°.	75°.	100°.
Gms. lactone per 100 gms. H_2O.....	2.5	5.2	18.4	87.4	176.0

DIPHENIC ACID (o, o' bibenzoic acid) HOOC (*o*) $C_6H_4.C_6H_4$ (*o*) COOH.

Solubility of Diphenic Acid in Aqueous Solutions of Hydrochloric Acid at 25°. (Knox and Richards, 1919.)

Equiv. Normality of HCl.....	0.00	2.103	3.985	5.928	7.748
» $C_{14}H_{10}O_4$.	0.00520	0.00182	0.00144	0.00112	0.00118

Freezing-point data are given by Efremov, 1919 and 1919*a*. for mixtures of diphenyl and picric acid and diphenyl and styphnic acid.

DIPHENYL AMINE $(C_6H_5)_2NH$.

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given for mixtures of diphenyl amine and each of the following compounds :

Guaicol (Puschin and Vaic, 1926.)
Hydroquinol, α and β Napthol, *o*, *m* and *p* Nitro phenol (Kremann and Schadinger, 1919.)
o Nitro phenol (Giua and Cherchi, 1919.
1.2.4 Dinitro phenol, Picric acid (Kremann and Schadinger, 1919.)
Picric acid (Giua and Cherchi, 1919.)
s Trichlor phenol » » »
Quinone (Kremann, Sutter, Sitte, Strzelba and Dobotzky, 1922.)
Pyrogallol (Kremann and Schadinger, 1919).
Pyrocatechol » » »
Resorcinol » » »
Sarkosin anhydride (Pfeiffer and Angern, 1926.)

EDESTIN.

Solubility of Edestin in Aqueous Solutions at 25°. (Kodama, 1922.)

Crystalline edestin, prepared from hemp seed by the method of Osborne, was used. Into a series of flasks, 0.05 gm. edestin and 10 cc. portions of aqueous HCl or Na OH solutions of various concentrations were placed. The mixtures were kept in a thermostat at 25° for 30 minutes. The p_H was determined by Clark's method. The mixtures were filtered and the dissolved edestin in the filtrates determined nephelometrically. The results show that edestin dissolves as the HCl salt in solutions more acid than p_H 5.9 and as the Na OH salt in solutions more alkaline than p_H 8.0. Between p_H 5.9 and 8.0 the amount dissolved could not be detected by the nephelometric method. The iso electric point of edestin is at p_H 5.9. Neutral Na Cl solutions dissolve edestin only when the concentration of Na Cl is greater than 2.0 normal and the acidity of the solution not more than p_H 5.9.

ELAIDIC ACID $C_8H_{17}CH:CH(CH_2)_2COOH$.

Solubility of Elaidic Acid in Several Solvents. (Lebrun, 1925.)

Solvent.	t°.	Gms. $C_{13}H_{24}O_2$ per 100 gms. solvent.
Acetylene dichloride (trans) (b. pt. 48°.3)	0	10.97
» » (cis) (b. pt. 60°.2)	0	6.20
Ethyl chlorisocrotonate	24	47.7
Crotonic nitrile (b. pt. 107°.7–108°.2)	25	17.45
» » (b. pt. 121°.8–122°.3)	25	12.33
Bromo butene (b. pt. 93°.9)	0	3.68
» » (b. pt. 85°.5–85°.6)	0	4.10

EMETINE $C_{30}H_{44}N_2O_4$.

Solubility in Water. (Kolthoff, 1925.)

The dissociation constants were found to be $K_1 = 2.3.10^{-7}$ and $K_2 = 1.7.10^{-6}$. The solubility product, calculated as a mono acid base is $L_{Emetine\ OH} = 3.7.5.10^{-9}$. From this and K_1 the solubility was calculated to be 2.10^{-3} gm. mol. per liter at 15°.

EPICHLORHYDRIN $O\begin{matrix}CH.CH_2Cl\\CH_2\end{matrix}$.

Reciprocal Solubility of Epichlorhydrin and Water. (Leoni and Benelli, 1922.)

Above 80° the epichlorhydrin begins to react with H_2O and data cannot be obtained above this temperature.

H_2O Rich Layer.

t°	Gms. C_3H_5OCl per 100 gms. sat. sol.
30.2	6.60
52.0	7.53
65.0	8.45
72.0	9.34
80.2	10.47

Epichlorhydrin Rich Layer.

t°.	Gms. C_3H_5OCl per 100 gms. sat. sol.
25.0	98.48
45.0	97.43
70.0	95.82
80.4	94.17

Solubility of Epichlorhydrin in Aqueous Solutions of Acetic Acid.

(Leone and Benelli, 1922.)

Weighed amounts of aqueous acetic acid solutions of three concentrations were mixed with weighed amounts of epichlorhydrin and the temperatures of clearing and clouding determined. The results are all expressed in weight per cent. On account of reaction of the constituents, determinations could not be made above 80°. The authors' results were plotted and the following values for regular intervals of temperature were read from the curves. At each temperature there are two concentrations of epichlorhydrin at which saturation occurs. One represents the epichlorhydrin rich layer and the other the epichlorhydrin poor layer.

	Aqueous 14.93 per cent CH_3COOH.		Aqueous 30.49 per cent CH_3COOH.		Aqueous 50.0 per cent CH_3COOH.	
	Wt. per cent C_3H_5OCl in		Wt. per cent C_3H_5OCl in		Wt. per cent C_3H_5OCl in	
t°.	lighter layer.	heavier layer.	lighter layer.	heavier layer.	lighter layer.	heavier layer.
25.....	9.0	98.5	16.5	97.2	50.0	94.2
30.....	9.5	98.7	18.0	97.0	52.0	93.8
35.....	10.0	98.0	19.0	96.5	54.5	93.2
40.....	10.5	97.8	20.0	96.0	57.0	92.0
45.....	11.0	97.5	22.0	95.3	60.0	91.0
50.....	11.5	97.0	24.0	94.7	63.5	89.5
55.....	12.0	96.5	26.0	94.0	67.5	87.5
60.....	13.0	96.0	29.0	93.5	72.5	85.0
63 (crit. temp.).	—	—	—	—	81.0	
65.....	14.0	95.5	33.0	93.0		
70.....	15.0	95.0	37.5	92.5		
75.....	16.5	94.0	43.0	91.5		
80.....	18.5	93.0	50.0	90.0		

Isotherms for the System Epichlorhydrin, Acetic Acid and Water at 0°, 10°, 40° and 60°.

(Leone and Benelli, 1922.)

The authors' determinations were plotted on cross section paper and from the four curves the following values for regular intervals of concentration of acetic acid were read. At each concentration of acetic acid there are two concentrations of epichlorhydrin at which saturation occurs. There is a maximum for each curve which corresponds to the concentration of acetic acid above which the three constituents mix in all proportions. The results show for both acetic acid and epichlorhydrin the grams of each per 100 gms. of homogeneous mixture of the two with water.

Gms. CH_3COOH per 100 gms. sat. sol.	Gms. C_3H_5OCl per 100 gms. sat. solution at							
	0°.		10°.		40°.		60°.	
0.....	6.48	98.91	6.52	98.72	7.00	98.0	8.0	97.0
5.....	6.7	93.2	7.3	92.3	8.0	90.5	9.3	89.0
10.....	7.5	86.2	8.3	85.2	9.2	82.0	11.4	80.0
15.....	8.4	79.0	9.7	77.5	10.6	72.5	14.5	69.0
20.....	9.7	70.0	11.5	68.5	13.8	60.7	22.5	53.5
22.....	10.5	66.4	12.5	64.0	16.0	55.0	30.0	40.0
24.....	11.0	62.0	13.5	59.0	20.0	48.0		
26.....	12.1	56.7	15.0	53.5	27.0	39.0		
28.....	13.8	51.0	17.5	45.5				
30.....	16.5	43.0	25.0	30.0				
31.....	18.7	37.0						
32.....	25.0	27.0						

ERUCIC ACID $C_8H_{17}CH{:}CH(CH_2)_{11}COOH$.

100 cc. of a sat. solution of erucic acid in 91.53 wt. per cent C_2H_5OH contain 2.356 gms. $C_8H_{17}CH{:}CH(CH_2)_{11}COOH$ at 0°. (Thomas and Mattikow, 1926.)

ERYTHRITOL $(CH_2OH.CHOH)_2$.

Solubility of Erythritol in Water Determined by the Freezing-Point Method. (Pushin and Glagoleva, 1922.)

t° of cryst.	Mol. per cent $(CH_2OH.CHOH)_2$.	Solid Phase.	t° of cryst.	Mol. per cent $(CH_2OH.CHOH)_2$.	Solid Phase.
— 1.1..	0.9	Ice	65.0..	26.1	$(CH_2OH.CHOH)_2$
— 2.4..	2.0	»	70.5..	29.0	»
— 3.1..	2.5	»	76.2..	33.3	»
— 4.4..	3.0	»+$(CH_2OH.CHOH)_2$	82.0..	39.8	»
— 1.0..	4.8	$(CH_2OH.CHOH)_2$	87.8..	42.4	»
—14.0..	7.0	»	97.5..	56.4	»
22.8..	9.0	»	102.5..	65.7	»
27.4..	11.1	»	106.5..	75.2	»
36.5..	13.4	»	110.2..	80.0	»
40.4..	14.4	»	114.0..	92.4	»
54.6..	17.5	»	116.6..	100.0	»

Tribromo, di chloro **ETHANES**.

Freezing-point data for the system $CHBr_2.CCl_2Br + CHClBr.CClBr$ are given by Van de Walle, 1925.

Tetra chlor **ETHANE** $C_2H_2Cl_4$.

Freezing-point data for mixtures of tetrachlor ethane and naphtalene are given by Cohen, de Meester and Moesfeld, 1925.

Tetra chlor, dinitro **ETHANE** $C_2(NO_2)_2Cl_4$.

30 cc. of dry nitrogen peroxide (N_2O_4), distilled from P_2O_5, dissolve 15.7 gms. $C_2(NO_2)_2Cl_4$ at 0°. The solubility of tetrachlor dinitro ethane in superpalite and in chlorpicrin is about of the same order of magnitude.

(Argo, James and Donnelly, 1919.)

ETHYL ACETATE $CH_3COOC_2H_5$.

Solubility of Ethyl Acetate in Water. (Glasstone and Pound, 1925.)

Highly purified ethyl acetate was used. A slight excess of it was shaken with water at a temperature below that of the experiment and then placed in a thermostat. The excess of ethyl acetate then separating caused the liquid to become cloudy, but this disappeared in an hour or two. Care was always taken that the excess of ethyl acetate present was not large enough to require a correction for the amount of water dissolved by it. For analysis the saturated solution was weighed. The ethyl acetate was distilled out, hydrolyzed with standard Na OH, and estimated in the usual way.

t°.	Gms. $CH_3COOC_2H_5$. per 100 gms. H_2O.	t°.	Gms. $CH_3COOC_2H_5$ per 100 gms. H_2O.
0.....	10.40	30.....	7.06
10.....	8.96	37.....	6.65
20.....	7.85	40.....	6.50
25.....	7.39	50.....	6.04

The following results, in terms of grams $CH_3CO OC_2H_5$ per 100 gms. H_2O, are probably less accurate than the above. At 16°, 12.5 gms. (Linde, 1917, 1926); at 18°, 7.3 gms. (von Euler and Svanberg, 1917, 1926); at 20°, 6.88 gms. (approx. det. only) (Führer, 1924); at 29°.7, 7.47 gms. (von Euler and Rudberg, 1924).

Solubility of Ethyl Acetate in Aqueous Solutions.

(Glasstone and Pound, 1925; Glasstone, Dimond and Jones, 1926; Glasstone, Dimond and Harris, 1926.)

These authors have made a very careful and comprehensive study of the solubility of ethyl acetate in aqueous solutions of various salts and sugars. They give results at 25° and at 50° for aqueous solutions of Li Cl, Li Br, Li I, K Cl, K Br, K I, Na Cl, Na Br, Na I, Rb Cl, Rb Br, Rb I, Cs Cl, Cs Br, Cs I, NH_4 Cl, NH_4 Br, NH_4 I, dextrose, levulose, sucrose and lactose. They also give results at 25° for aqueous solutions of $Na\,NO_3$, $Pb\,(NO_3)_2$, $NH_4\,NO_3$, $CH_3\,CO\,O\,NH_4$, $K\,Cr\,O_4$, $Ca\,(NO_3)_2$, $Sn\,(NO_3)_2$, $Ba\,(NO_3)_2$, $K\,NO_3$, $Ba\,Cl_2$, $Cu\,Cl_2$, $Ni\,SO_4$, $K_2\,SO_4$, $(CO\,O\,NH_4)_2$, $Mg\,SO_4$, $Na_2\,SO_4$, $Cu\,SO_4$, $Zn\,SO_4$, $K_4\,Fe\,(CN)_6$, $K_3\,Fe\,(CN)_6$, $K\,Cl\,O_3$, K F and various mixtures of these salts. The results are, however, all expressed « in terms of the number of *gram molecules of water* required to dissolve one gram molecule of ethyl acetate in the presence of various molecular quantities of added sugar or salt ». The experiments were made for the purpose of explaining the salting-out effect of various compounds. It was concluded from the results that the hydration of the salt may be one of the factors responsible for the salting-out effect; this effect may, however, be due to some other fundamental property of salt ions or molecules. The salting-out power of a mixture is, in general, equal to the sum of the salting-out powers of the constituents, provided allowance is made for the electrical interaction of the ions. The salting-out effect cannot be utilized for the detection of complex ion formation.

In spite of the undoubted interest of these results as quantitative solubility measurements, their recalculation to the more usual terms of expression would involve a considerable effort. Furthermore, since they are published in one of the most easily accessible journals there appears less need for their reproduction in the present compilation.

Solubility of Ethyl Acetate in Aqueous Solutions of :

(von Euler and Rudberg, 1924.)

Lithium Nitrate at 29°.7.

Gm. mols. per liter.	
$LiNO_3$.	$CH_3\,COO\,C_2\,H_5$.
0.00.....	0.791
0.0362.....	0.787
0.0723.....	0.784
0.1810.....	0.764

Potassium Nitrate at 30°.1.

Gm. mols. per liter.	
KNO_3.	$CH_3\,COO\,C_2\,H_5$.
0.000.....	0.779
0.100.....	0.756
0.250.....	0.734

Solubility of Ethyl Acetate at 16°-16°.5 in Aqueous Solutions of :

(Linde, 1917, 1926.)

Sodium Chloride.

Mols. Na Cl. per liter.	Gms $CH_3\,COO\,C_2\,H_5$ per 100 cc. solvent.
0.125.....	11.5 (12.7)
0.25.....	10.75 (11.6)
0.50.....	9.9 (10.8)
0.75.....	9.0 (10.0)
1.00.....	8.4 (9.2)

Sodium Nitrate.

Mols. $NaNO_3$ per liter.	Gms $CH_3\,COO\,C_2\,H_5$ per 100 cc. solvent.
0.00.....	12.5
0.25.....	12.0
0.50.....	11.8 (13.5)
0.75.....	11.5
1.00.....	11.4 (13.3)

The results in parentheses show the grams of $CH_3\,CO\,O\,C_2\,H_5$ per 100 cc. of salt solution made with 0.95 normal $C_2\,H_5\,OH$ instead of water.

100 cc. sat. solution of ethyl acetate in aqueous 1.0 normal aniline nitrate contain 12.5 gms $CH_3\,CO\,O\,C_2\,H_5$ at 18°. (von Euler and Svanberg, 1917, 1926.)

ETHYL ALCOHOL C_2H_5OH

The Freezing-Points of Mixtures of Denatured Alcohol and Water.

(Davis and Harvey, 1919).

The denatured alcohol was composed of 100 parts of ethyl alcohol ($d_{20} = 0.811$) 10 parts of methyl alcohol ($d_{20} = 0.817$) and 0.5 part benzolene ($d_{20} = 0.800$, b. pt. 150°-265°). The freezing temperatures were measured by a nickel resistance thermometer. The resistance was read at intervals at a slowly increasing temperature and the break in the curve was taken to indicate the point of change from solid to liquid phase, that is, the melting-point.

t° of m. pt.	d_{20} of mixture.	Vol. per cent denatured alcohol in mixture.	t° of m. pt.	d_{20} of mixture.	Vol. per cent denatured alcohol in mixture.
— 2.8...	0.9935	5.0	—35.7...	0.9264	55.0
— 4.0...	0.9873	10.0	—38.9...	0.9138	60.0
— 6.0...	0.9816	15.0	—41.0...	0.9037	65.0
— 8.5...	0.9753	20.0	—43.6...	0.8926	70.0
—11.5...	0.9715	25.0	—48.0...	0.8802	75.0
—14.8...	0.9656	30.0	—53.7...	0.8677	80 0
—18.3...	0.9592	35.0	—62.0...	0.8529	85.0
—22.1...	0.9515	40.0	—73.7...	0.8413	90.0
—26.9...	0.9442	45.0	— ...	0.8268	95.0
—31.1...	0.9845	50.0	— ...	0.8117	100.0

Reciprocal Solubility of Ethyl Alcohol, Ethyl Ether and Water at 15°.

(Boutin and Sanfourche, 1919.)

The amount of one constituent necessary to produce clouding or clearing in known mixtures of the other two was determined.

Gms. per 100 gms. Homogeneous mixture			Gms. per 100 gms. Homogeneous mixture		
H_2O.	C_2H_5OH.	$(C_2H_5)_2O$.	H_2O.	C_2H_5OH.	$(C_2H_5)_2O$.
93.0	0.0	7.0	29.5	27.8	42.9
87.6	4.9	7.4	23.0	27.0	50.0
82.5	9.7	7.7	18.0	24.9	57.1
77.1	14.9	8.0	10.7	19.4	69.9
69.7	20.3	10.0	6.8	14.7	78.5
61.3	23.9	13.8	4.4	9.9	85.7
55.7	26.1	18.3	2.5	5.0	92.4
49.1	27.4	23.5	1.1	0.0	98.9
39.9	28.2	35.9			

Reciprocal Solubility of Ethyl Alcohol, Ethyl Ether and Water at 15°.

(Desvergnes, 1921.)

The volume of ether of $d_{15} = 0.724$, necessary to produce clouding in mixtures of alcohol of $d_{15} = 0.812$ and water, at 15° was determined.

Aq. — C_2H_5OH Mixture		cc. Ether to produce clouding.	Sum of Volumes employed.	Actual Volume of mixture.	Volume of upper layer in mixture of 100 cc. of cloudy liquid + 30 cc. of ether.
cc. H_2O.	cc. C_2H_5OH.				
100	110	159.0	369.0	356.0	97.0
100	100	131.0	331.0	321.0	90.0
100	90	112.0	312.0	298.0	83.0
100	80	81.0	261.0	251.0	72.5
100	70	59.0	229.0	221.0	61.0
100	60	40.0	200.6	192.0	52.0
100	50	32.0	182.0	177.0	43.5
100	40	22.5	162.5	156.5	39.0
100	30	15.0	145.0	141.0	32.0
100	20	13.5	133.5	129.5	31.5
100	10	12.5	122.5	119.0	30.0

Reciprocal Solubility of Ethyl Alcohol, Gasoline and Water at 5° and at 20°.

(Gay and Massol, 1925; Perrakis and Massol, 1924.)

A titration method was used. Various weighed mixtures of alcohol and gasoline were titrated with water to appearance of clouding. Above 75 per cent of alcohol it was necessary to titrate mixtures of alcohol and water with gasoline. The composition of the mixture was determined in all cases by weighing. The gasoline had a $d_{\frac{20}{4}}$ of 0.747. On distilling 200 cc. the first 10 cc. came over at 60-69° and the last 10 cc. at 215-236°. A diagram of the distillation curve shows a somewhat wavy line between these temperatures.

Isotherm at 5°.		Isotherm at 20°.			
Gms. per 100 gms. cloudy mixture.		Gms. per 100 gms. cloudy mixture.		Gms. per 100 gms. cloudy mixture.	
C_2H_5OH.	Gasoline.	C_2H_5OH.	Gasoline.	C_2H_5OH.	Gasoline.
17.485	82.320	3.210	96.725	73.260	3.650
29.800	69.700	11.390	88.400	64.170	0.907
36.150	62.970	24.060	75.360	55.510	0.281
55.880	42.490	26.025	73.070	46.530	0.112
77.880	13.930	54.635	42.500	44.820	0.089
78.880	8.860	67.275	27.750	39.759	0.053
76.725	3.485	73.555	17.910	34.559	0.023
69.215	0.890	76.655	10.155	31.760	0.0105
63.570	0.570	74.310	4.700	24.299	0.0036
57.907	0.333				
54.151	0.117				

The authors also discuss the effect of salts upon the dehydration of alcohol. It was shown that ammonium sulfate and hyposulfite are poor dehydrating agents and potassium fluoride and carbonate are good dehydrating agents. They give results showing the composition of the upper layers in contact with sat. solutions of K_2CO_3. Much more complete data for the system alcohol + gasoline + water + K_2CO_3 at 20° are given by Gay, Mion and Servigne, 1924. These authors give numerical data and diagrams for the composition of each of the three layers which separate in this system.

Reciprocal Solubility of Ethyl Alcohol, Heptane and Water.

(Ormandy and Craven, 1922.)

The heptane was purified by acid washing and fractionation. The $d_{\frac{15}{15}} = 0.6887$ and the b. pt. was 98°.3-98°.4 (760 mm.). The aniline point was 71°. The determinations were made by adding to a given volume of the hydrocarbon a mixture of alcohol and water untill clouding appeared. Two concentrations of alcohol contained in two pipets were used and the clouding produced and discharged alternately. The weights of each constituent were calculated from the specific gravity of each and the results reported on the weight per cent basis.

Results at −30°.		Results at 0°.		Results at +30°.	
Wt. % C_2H_5OH in aq.-alc. mixture used.	Wt. % heptane in sat. sol.	Wt. % C_2H_5OH in aq.-alc. mixture used.	Wt. % heptane in sat. sol.	Wt. % C_2H_5OH in aq.-alc. mixture used.	Wt. % heptane in sat. sol.
98.23	90.97	98.30	90.59	98.17	91.18
98.51	81.14	97.92	80.65	95.82	80.15
98.25	69.37	97.98	69.29	95.35	69.42
98.18	59.19	96.91	58.78	94.26	58.84
97.99	49.52	96.41	48.68	93.47	49.44
97.06	39.31	95.72	38.61	92.78	39.00
96.28	29.54	94.36	29.57	91.16	29.28
94.62	20.56	91.98	19.75	88.61	19.96
92.93	15.24	90.27	15.42	85.94	14.25
89.37	8.92	85.35	8.50	80.94	8.39

Similar determinations made with unpurified heptane gave results close to the above. It is suggested that the higher values obtained by Bonner, 1910, are probably due to the presence of a small amount of aromatic hydrocarbon in his heptane.

Freezing-Points of Mixtures of 92.0 wt. per cent Alcohol and Various Samples of Heptane. (Ormandy and Craven, 1922.)

Three samples of heptane, obtained from different sources, were used. The densities and boiling-point fractionation figures of the samples show considerable differences from published data. The samples were, therefore, of unknown purity.

Results with: Sample I.		Results with: Sample II.		Results with: Sample III.	
F. pt.	Wt. % Heptane.	F. pt.	Wt. % Heptane.	F. pt.	Wt. % Heptane.
—30.5	13.27	—30.3	13.66	—30.3	16.22
—22.2	14.91	—23.1	15.17	—20.5	18.48
—14.6	16.69	—11.0	18.04	—10.9	21.23
0.4	20.77	+ 3.2	22.36	+ 0.9	25.18
21.9	29.93	19.6	29.38	10.7	29.35
32.0	37.06	29.9	36.43	20.7	35.02
				30.9	44.40

Data are also given for the freezing-points of 92.0 wt. % alcohol containing different amounts of various mixtures of heptane and benzene.

Reciprocal Solubility of Ethyl Alcohol, Hexane and Water at —30° and + 30°. (Ormandy and Craven, 1922.)

Three samples of hexane, obtained from different sources, were used. These had densities and boiling-points which differed from published data, and were, therefore, of unknown purity. Reciprocal solubility determinations were made as described under heptane (previous page). The original determinations of the authors, when plotted on cross section paper, give average curves from which the following values were read.

Wt. % C_2H_5OH in aq. Alcohol Mixture used.	Gms. Hexane per 100 gms. sat. sol. at		Wt. % C_2H_5OH in aq. Alcohol Mixture used.	Gms. Hexane per 100 gms. sat sol. at	
	—30°.	+30°.		—30°.	+30°.
75.0	—	8.0	92.0	21.0	60.0
80.0	—	12.5	94.0	29.5	81.0
84.0	8.0	19.0	95.0	36.0	92.0
86.0	10.0	23.5	96.0	47.0	—
88.0	12.5	30.0	97.0	68.5	—
90.0	16.0	41.0	98.0	92.0	—

Freezing-Points of Mixtures of 92.0 wt. per cent Alcohol and Various Samples of Hexane. (Ormandy and Craven, 1922.)

The samples of hexane were the same as used for the preceding determinations.

Results with: Sample I.		Results with: Sample II.		Results with: Sample III.	
F. pt.	Wt. % Hexane.	F. pt.	Wt. % Hexane.	F. t.	Wt. % Hexane.
—31.1	21.97	—31.4	21.81	—29.9	21.98
—26.2	23.18	—21.8	24.85	—21 0	24.71
— 9.5	29.58	— 8.2	30.12	—11.5	28.11
+ 7.6	39.16	+ 7.8	39.48	+ 0.3	33.70
20.6	53.71	20.3	52.89	10.7	40.59
30.5	66.57	30.7	66.63	20.8	51.32
				30.8	64.88

Data are also given for the freezing-points of 92.0 wt. % alcohol containing different amounts of a 1 : 1 and a 3 : 1 mixture of hexane and benzene.

Reciprocal Solubility of Ethyl Alcohol, Pentane and Water at —30°, 0° and +15°.

(Ormandy and Craven, 1922.)

The determinations were made by the method outlined under heptane (p. 1200).

Results at —30°.		Results at 0°.		Results at +15°.	
Wt. % C_2H_5OH in Aq. Alcohol mixture used.	Wt. % Pentane in sat. sol.	Wt. % C_2H_5OH in Aq. Alcohol mixture used.	Wt. % Pentane in sat. sol.	Wt. % C_2H_5OH in Aq. Alcohol mixture used.	Wt. % Pentane in sat. sol.
76.54.....	7.90	79.55.....	15.89	74.56.....	13.38
82.60.....	14.10	84.26.....	25.51	78.22.....	18.35
85.25.....	18.82	86.05.....	32.24	84.63.....	27.67
88.53.....	28.48	87.98.....	42.66	85.45.....	37.54
90.35.....	38.11	89.29.....	53.66	86.91.....	47.05
91.42.....	45.66			88.08.....	58.55
92.16.....	58.82			89.04.....	68.23
				90.27.....	77.39

Freezing-Points of Mixtures of 92.0 wt. per cent Alcohol and :

(Ormandy and Craven, 1922.)

Pentane.		Isopentane.	
F. pt.	Wt. % Pentane.	F. pt.	Wt. % Isopentane.
—31.0.....	26.70	—28.5.....	31.59
—22.5.....	30.41	—14.2.....	35.21
—16.0.....	35.80	— 5.0.....	40.69
— 5.0.....	39.47	+ 4.3.....	48.07
+ 4.9.....	45.62	12.5.....	57.42
14.0.....	55.91	21.3.....	67.18
21.0.....	63.68		

Similar data are also given for the freezing-points of 92.0 wt. % alcohol containing different amounts of a 1 : 1 and a 3 : 1 mixture of pentane and benzene.

Reciprocal Solubility of Ethyl Alcohol, Toluene and Water.

(Ormandy and Craven, 1921.)

The determinations were made by the method outlined under heptane (p. 1200). An extensive series of determinations were made at seven different temperatures. These results have been plotted and the following table constructed from the curves.

Wt. % C_2H_5OH in Aq. Alcohol mixture used.	Gms. $C_6H_5CH_3$ per 100 gms. sat. solution at						
	—20°.	—15°.	0°.	+5°.	15°.	25°.	30°.
60.....	—	—	—	—			8.0
65.....	5.5	6.5	8.5	9.5	10.2	(11.5)	12.5
70.....	8.6	10.5	12.7	14.0	15.6	(17.5)	19.5
75.....	13.5	16.2	19.2	21.0	23.7	(28.0)	31.0
80.....	20.7	25.0	30.5	33.5	38.5	46.0	49.5
85.....	33.2	41.0	52.0	55.5	62.5	66.5	68.7
90.....	62.5	71.0	77.0	79.5	82.0	?	83.7
95.....	92.5	94.5	94.5	95.0	93.7	?	95.7

Data for the reciprocal solubility of ethyl alcohol, water and a mixture of 3 volumes of benzene and 1 volume of toluene at —15°, 0°, +15° and 30° are also given.

Freezing-Points of Mixtures of 99.3 wt. per cent Alcohol and Toluene.

(Ormandy and Craven, 1921.)

F. pt.	Wt. % 99.3 Wt. % Alcohol in mixture.	F. pt.	Wt. % 99.3 Wt. % Alcohol in mixture.	F. pt.	Wt. % 99.3 Wt. % Alcohol in mixture.
—50.0.....	66.3	—20.8.....	39.8	—5.8.....	18.3
—40.6.....	59.7	—18.3.....	36.3	—2.2.....	12.6
—28.2.....	48.0	—15.4.....	32.6	+1.1.....	7.0
—27.1.....	46.6	—12.3.....	28.0	3.5.....	2.7
—24.0.....	43.4	— 8.8.....	23.4		

Reciprocal Solubility of Ethyl Alcohol, Xylene and Water at —30°, 0° and +30°. (Ormandy and Craven, 1921.)

The xylene was a commercial sample having $d_{15}^{15} = 0.8665$ and b. pt. 138°-148°. The determinations were made by the method outlined under heptane (p. 1200).

Results at —30°.		Results at 0°.		Results at +30°.	
Wt % C_2H_5OH in aq. alcohol mixture used.	Gms. xylene per 100 gms. sat. sol.	Wt % C_2H_5OH in aq. alcohol mixture used.	Gms. xylene per 100 gms. sat. sol.	Wt % C_2H_5OH in aq. alcohol mixture used.	Gms. xylene per 100 gms. sat. sol.
78.65	11.59	72.35	9.47	66.55	8.67
80.60	13.92	74.24	11.25	69.40	11.45
82.96	17.40	76 97	14.39	73.00	15.77
85.46	22.20	80.33	19.57	77.24	23.12
87.14	26.73	84.05	28.02	81.30	34.70
90.90	41.89	87.24	40.92	84.68	52.01
92.66	53.49	90.24	64.09	92.20	82.67
94.11	70.77	93.90	83.18	91.90	92.22
95.66	83.87	93.70	92.67		
96.20	92.87				

Freezing-Points of Mixtures of 99.3 wt. % Ethyl Alcohol and Xylene. (Ormandy and Craven, 1921.)

The xylene was a mixture of *o*, *m* and *p* xylene.

t° of f. pt.	—30°.0.	—24°.7.	—19°.8.	—14°.9.	—10°.9.	—1°.0.
Wt. % of 99.3 wt. % alcohol in mixture.	56.1	49.6	43.1	35.8	29.7	11.9

Reciprocal Solubility of Ethyl Alcohol, Phenyl Ether and Water at 30°. (Perrakis, 1925.)

The amount of water required to produce clouding in various mixtures of ethyl alcohol and phenyl ether, $(C_6H_5)_2O$, was determined by a titration method.

Wt % C_2H_5OH in alc. phenyl ether mixture.	Gms. H_2O to cause clouding of 100 cc. of mixture.	Wt % C_2H_5OH in alc. phenyl ether mixture.	Gms. H_2O to cause clouding of 100 cc. of mixture.
13.18	0.6206	36.68	2.2654
22.01	1.1151	40.08	2.5709
28.41	1.5360	43.16	2.8450
32.76	1.9230	50.57	3.5400

Reciprocal Solubility of Ethyl Alcohol and Gasoline in Presence of a Third Solvent. (Rothen and Boutier, 1923.)

The alcohol had $d_{15} = 0.812$. The gasoline was an American product of $d_{15} = 0.723$. The titration method was employed. The figures in the table below show the cubic centimeters of the third solvent (A) which must be added to 100 cc. of the following volume per cent mixtures of alcohol and gasoline to obtain a homogeneous solution at 0° and 15°.

	10 % Alcohol.		20 % Alcohol.		30 % Alcohol.		40 % Alcohol.		50 % Alcohol.	
Third solvent (A).	0°.	—15°.	0°.	—15°.	0°.	—15°.	0°.	15°.	0°.	—15°.
Benzene	*	*	*	*	23.0	*	13.0	24.0	11.0	18.0
Ether	–	–	11.8	16.3	7.9	13.2	6.0	10.6	4.2	8.8
Acetone	19.0	36.0	18.0	50.0	18.0	56.0	15.0	43.0	12.0	35.0
Iso propyl alcohol	6.3	10.4	7.5	14.8	8.4	17.0	8.6	14.5	6.2	13.0
Iso butyl »	–	–	–	–	7.5	12.0			6.0	12.0
Normal butyl alcohol	4.1	5.3	4.6	6.7	4.7	7.5	4.5	5.8	3.8	7.5
Amyl alcohol	4.1	5.3	4.4	6.3	4.6	7.4	4.4	7.7	3.4	7.3
Cyclohexane	3.9	4.9	4.5	6.2	4.4	6.7	4.0	6.8	3.3	6.9
Butyl cresol	5.5	6.3	4.8	6.3	4.2	6.3	3.6	6.1	3.1	5.7
Castor oil	*	*	30.0	*	18.0	41.0				
Terpineol	9.3	10.8	7.6	10.2	6.4	10.0	–		–	–

* Indicates that a homogeneous mixture could not be obtained.

The authors also give diagrams showing the amounts of the third solvent required at temperatures from about — 20 to + 20°.

FREEZING-POINTS OF MIXTURES OF ETHYL ALCOHOL AND PHENOL. (Perrakis, 1925.)

An ordinary cryoscopic apparatus was used and the usual precautions taken.

t° of cryst.	Mol. per cent C_2H_5OH in sat. sol.	t° of cryst.	Mol. per cent C_2H_5OH in sat. sol.
−30.....	49.23	17.1.....	19.38
−15.2.....	41.00	22.8.....	16.25
− 1.7.....	35.00	32.55.....	7.29
+ 2.6.....	30.91	39.9.....	0.00
9.9.....	25.09		

Similar data are given for mixtures of ethyl alcohol and phenyl ether $(C_6H_5)_2O$.

MUTUAL MISCIBILITY TEMPERATURE OF A MIXTURE OF ETHYL ALCOHOL AND PARAFFINE. (Howard and Patterson, 1926.)

To a mixture of equal weights of absolute C_2H_5OH and paraffine (b. pt. 168-180°), which had a mutual miscibility temperature of 19°.9, increasing amounts of a large number of salts were added and the elevation of the mutual miscibility temperature determined. Results showing the effect of increasing amounts of water upon the mutual miscibility temperature are also given. The critical solution temperature of ethyl alcohol and paraffine was found to be at 33°.5 and at 13 per cent C_2H_5OH.

ETHYL AMINES $C_2H_5.NH_2$, $(C_2H_5)_2NH$, $(C_2H_5)_3N$.

DISTRIBUTION OF ETHYL AMINE AT 25° BETWEEN: (Smith, 1921-1922.)

Water and Chloroform.

Millimols. $C_2H_5.NH_2$ per liter		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
1.50	0.55	0.366
2.525	1.00	0.396
4.30	1.80	0.418
10.20	4.80	0.470
18.45	9.45	0.512
25.50	20.70	0.780

Acetone and Glycerol.

Millimols. $C_2H_5.NH_2$ per liter		
Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
0.67	1.20	0.558
1.25	1.625	0.77
1.26	1.76	0.715
2.25	2.70	0.835
4.76	4.72	1.01
9.76	8.20	1.19

Water and Ether.

Millimols. $C_2H_5.NH_2$ per liter		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
2.550	0.450	0.176
3.975	0.675	0.170
6.075	1.125	0.185
9.8	1.60	0.163
14.8	2.50	0.169

Water and Xylene.

Millimols. $C_2H_5.NH_2$ per liter		
H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2)	$\frac{C_2}{C_1}$.
1.7955	0.2045	0.1140
3.654	0.346	0.0947
9.255	0.745	0.0805
19.284	1.426	0.074

DISTRIBUTION OF DIETHYL AMINE AT 25° BETWEEN: (Smith, 1921-1922.)

Water and Amyl Alcohol.

Millimols. $(C_2H_5)_2NH$ per liter		
H_2O layer (C_1).	$CH_3(CH_2)_3CH_2OH$ layer (C_2).	$\frac{C_2}{C_1}$.
0.65	1.625	2.52
1.05	2.9625	2.82
1.675	5.450	3.26
2.875	10.625	3.70
4.95	20.00	4.04

Water and *n* Butyl Alcohol.

Millimols. $(C_2H_5)_2NH$ per liter		
H_2O layer (C_1).	$CH_3.(CH_2)_2CH_2OH$ layer (C_2).	$\frac{C_2}{C_1}$.
0.275	0.575	2.09
0.675	1.540	2.30
1.35	3.175	2.35
2.50	6.8	2.72

Water and Isobutyl Alcohol.

Millimols. $(C_2H_5)_2NH$ per liter		
H_2O layer (C_1).	$(CH_3)_2CH.CH_2OH$ layer (C_2).	$\frac{C_2}{C_1}$.
0.300	0.625	2.08
0.550	1.225	2.22
0.650	1.500	2.3
1.0875	2.6125	2.4

Distribution of Diethyl Amine at 25° Between.

(Smith, 1921-1922,)

Water and *sec.* Octyl Alcohol.

Millimols. $(C_2H_5)_2NH$ per liter		
H_2O layer (C_1).	$CH_3(CH_2)_5CHOH.CH_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.475	0.50	1.05
1.05	1.20	1.14
1.75	2.01	1.16
2.10	2.50	1.19

Water and *n* Butyl Bromide.

Millimols. $(C_2H_5)_2NH$ per liter		
H_2O layer (C_1).	$CH_3(CH_2)_3Br$ layer (C_2).	$\frac{C_2}{C_1}$.
1.10	0.725	0.660
2.10	1.3375	0.637
3.475	2.20	0.633
6.60	4.00	0.606

Water and *n* Butyl Ether

Millimols. $(C_2H_5)_2NH$ per liter		
H_2O layer (C_1).	$(C_4H_9)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.925	0.625	0.676
2.1625	1.375	0.632
4.05	2.45	0.605
7.75	4.55	0.587

Water and Benzene.

Millimols. $(C_2H_5)_2NH$ per liter		
H_2O layer (C_1).	C_6H_6 layer (C_2).	$\frac{C_2}{C_1}$.
2.1375	1.2375	0.578
3.875	2.475	0.638
6.575	4.35	0.662
11.95	9.05	0.756
22.30	18.30	0.822

Water and Brombenzene.

Millimols. $(C_2H_5)_2NH$ per liter		
H_2O layer (C_1).	C_6H_5Br layer (C_2).	$\frac{C_2}{C_1}$.
1.100	0.625	0.568
1.4625	0.8875	0.607
2.1875	1.1375	0.520
3.40	1.70	0.50
3.825	2.075	0.542
7.15	4.05	0.567

Water and *o* Dichlorbenzene.

Millimols. $(C_2H_5)_2NH$ per liter		
H_2O layer (C_1).	*o* $C_6H_4Cl_2$ layer (C_2).	$\frac{C_2}{C_1}$.
1.475	0.95	0.643
1.55	1.075	0.693
3.175	2.325	0.732
5.50	3.30	0.60
11.70	7.15	0.61

Water and 1.3.4 Trichlorbenzene.

Millimols. $(C_2H_5)_2NH$ per liter		
H_2O layer (C_1).	1.3.4. $C_6H_3Cl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
1.4375	0.4125	0.287
3.325	1.125	0.346
4.95	1.925	0.403
9.45	4.05	0.43

Water and Carbon Tetrachloride.

Millimols. $(C_2H_5)_2NH$ per liter		
H_2O layer (C_1).	CCl_4 layer (C_2).	$\frac{C_2}{C_1}$.
1.425	0.850	0.597
2.525	1.9375	0.700
5.075	4.00	0.788
7.80	7.00	0.897

Water and Chloroform.

Millimols. $(C_2H_5)_2NH$ per liter		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.300	0.600	2.00
0.800	2.000	2.50
1.625	5.025	3.09
4.350	17.95	4.13

Water and Ethyl Ether.

Millimols. $(C_2H_5)_2NH$ per liter		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.6125	0.4375	0.714
1.100	0.7375	0.671
1.650	1.075	0.652
2.875	2.025	0.704
7.90	6.30	0.798

Water and Iso Amyl Phenyl Ether.

Millimols. $(C_2H_5)_2NH$ per liter		
H_2O layer (C_1).	$C_5H_{11}.O.C_6H_5$ layer (C_2).	$\frac{C_2}{C_1}$.
1.85	0.815	0.440
3.30	1.35	0.410
5.775	2.55	0.442
9.50	3.90	0.411

Water and Ethylene Chloride.

Millimols. $(C_2H_5)_2NH$ per liter		
H_2O layer (C_1).	$CH_2Cl.CH_2Cl$ layer (C_2).	$\frac{C_2}{C_1}$.
0.95	0.835	0.880
1.875	1.05	0.886
2.15	1.925	0.886
4.475	4.075	0.910

Water and Paraffine oil.

Millimols. $(C_2H_5)_2NH$ per liter		
H_2O layer (C_1).	Paraffine oil layer (C_2).	$\frac{C_2}{C_1}$.
1.475	0.300	0.204
3.20	0.575	0.180
3.35	0.650	0.194
5.25	1.025	0.192
8.70	1.40	0.161
8.80	1.50	0.170
16.10	3.00	0.186

Water and Petroleum (b. pt. 145-155°) = Nonane.

Millimols. $(C_2H_5)_2NH$ per liter		
H_2O layer (C_1).	Petroleum layer (C_2).	$\frac{C_2}{C_1}$.
2.7125	0.856	0.313
4.175	1.275	0.305
0.442	1.30	0.289
4.825	1.425	0.295
7.25	2.05	0.283
11.35	3.25	0.287

DISTRIBUTION OF DIETHYL AMINE AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Xylene. Millimols. $(C_2H_5)_2NH$ per liter			Acetone and Glycerol. Millimols. $(C_2H_5)_2NH$ per liter		
H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.	Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
1.44	0.55	0.38	0.625	1.75	0.357
2.72	1.28	0.47	1.75	3.375	0.518
4.075	1.925	0.472	4.70	6.775	0.693
6.45	3.55	0.552	4.50	6.55	0.687
12.68	7.42	0.59	15.80	18.10	0.873

DISTRIBUTION OF TRIETHYL AMINE AT 25° BETWEEN : (Smith, 1921-1922.)

Water and Chloroform. Millimols. $(C_2H_5)_3N$			Water and Xylene. Millimols. $(C_2H_5)_3N$			Acetone and Glycerol. Millimols. $(C_2H_5)_3N$		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.	Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
0.0375	0.490	13.0	0.3125	0.9875	3.16	1.470	0.865	1.70
0.0516	0.800	15.5	0.625	2.475	3.96	2.875	1.175	2.44
0.194	3.806	19.7	0.80	3.60	4.50	6.35	1.65	3.85
0.425	9.575	22.5	1.49	8.51	5.72	13.20	2.25	5.87
			2.53	17.47	6.90	25.80	3.20	8.06

DISTRIBUTION AT 25° OF : (Smith, 1921-1922.)

Diethyl Amine Acid Phthalate (See Note p. 1301.) Between Acetone and Glycerol. Millimols. per liter			Triethyl Amine Acid Phthalate (See Note p. 1301.) Between Acetone and Glycerol. Millimols. per liter			Ethyl Phenyl Amine Between Water and Xylene. Millimols. per liter		
Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.	Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.	H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.450	2.0375	0.221	0.70	2.35	0.398	0.1940	0.582	3.00
0.775	4.15	0.187	1.10	4.075	0.270	0.2380	0.763	3.20
1.05	6.65	0.158	1.45	5.60	0.259	0.3437	1.13	3.29
1.325	9.975	0.133	2.00	9.35	0.214	0.4125	1.51	3.64
1.65	12.80	0.129	2.70	12.775	0.2115			

ETHYL BENZENE $C_6H_5.C_2H_5$, **ETHYL BUTYRATE** $C_3H_7CO_2.C_2H_5$.

100 gms. sat. sol. of Ethyl benzene in H_2O contain 0.014 gm. $C_6H_5C_2H_5$ at 15°
» » Ethyl butyrate » 0.616 gm. $C_3H_7CO_2.C_2H_5$ at 25°
(Führer, 1924.)

ETHYL BENZOATE $C_6H_5COO(C_2H_5)$.

FREEZING-POINTS OF MIXTURES OF ETHYL BENZOATE AND TIN TETRACHLORIDE.
(Kournakov, Perelmouter and Kanov, 1916.)

t°.	Mol. % $SnCl_4$.	t°.	Mol. % $SnCl_4$.	t°.	Mol. % $SnCl_4$.	t°.	Mol. % $SnCl_4$.
16.....	5.0	45.0....	30.0	14.0....	40.0	46.4....	55.0
27.5. ..	10.0	45.1....	31.5	42.0....	42.5	44.5....	60.0
33.8....	15.0	45.3....	33.0	44.8....	45.0	36.7....	70.0
39.5....	20.0	45.5*...	33.3	47.3....	48.0	26.5....	80.0
43.3....	25.0	45.3....	34.0	47.5**..	50.0	6.0....	90.0
44.0....	27.5	44.8....	38.0	47.3....	52.0	—33.0....	100.0

* M. pt. of the Compound $SnCl_4.2C_6H_5COOC_2H_5$. ** M. pt. of the Compound $SnCl_4.C_6H_5COOC_2H_5$

ETHYL BROMIDE, CHLORIDE and IODIDE C_2H_5Br, C_2H_5Cl, C_2H_5I.

100 gms. sat. sol. of Ethyl bromide in H_2O contain 0.952 gm. C_2H_5Br at 17°.5
» Ethyl chloride » 0.57 C_2H_5Cl –
» Ethyl iodide » 0.39 C_2H_5I 22°.5
(Führer, 1924.)

ETHYL ETHER $(C_2H_5)_2O$.

Reciprocal Solubility of Ether and Water.

(Hill, 1923; Kablukov and Malischeva, 1925.)

A new method for the determination of the reciprocal solubility of liquids was employed by these authors. It depends upon the simple application of the phase rule to the volumes obtained by mixing the two liquids in two different ratios by weight, in two separate experiments at the same temperature. The apparatus consists of flasks with two bulbs of 100 cc. and 300 cc. respectively, having the stem between the bulbs and above the upper bulb, very accurately graduated and calibrated. The method of calculation employed eliminates the correction for change of volume on mixing and enables the solubilities to be calculated directly from the volumetric readings. The flasks were rotated 1/2 hour in a thermostat and allowed to stand 1/2 hour before reading the volume changes.

	The Solubility of Ether in Water.			The Solubility of Water in Ether.		
		Gms. Ether per 100 gms. Water layer.			Gms. Water per 100 gms. Ether layer.	
t°.	Density of Water layer.	Hill.	K and M.	Density of Ether layer.	Hill.	K and M.
— 3.83...	—	12.752	— (12.2)	—	0.978	—
0.0....	—	11 668	— (10.3)	—	1.078	— (1.0)
10.0....	0.98219	9.040	9.01 (8.3)	0.72998	1.164	1.30
15.0....	0.98405	7.913	7.87 (7.0)	0.72404	1.240	1.35 (1.1)
20.0....	0.98478	6.896	6.88 (6.5)	0.71835	1.264	1.45 (1.3)
25.0....	0.98508	6.027	6.04 (5.6)	0.71309	1.338	1.58
30.0....	0.98505	5.340	5.34 (4.5)	0.70763	1.409	1,77

Determinations by other methods are as follows :

15.0....	0.985(1)	7.83(1)	8.43(2)	0.722(1)	1.04(1)
18.0....	—	7.88(3)	7.80(4)	—	—
20.0....	0.986(1)	6.89(1)	—	0.718(1)	1.10(1)
25.0....	0.987(1)	6.00(1)	6.05(2)	0.714(1)	1.19(1)

(1) Forbes and Coolidge. 1919; (2) Thorne, 1921; (3) Per 100 cc. H_2O, Linde, 1917, 1926; (4) Per 100 cc. H_2O, von Euler and Svanberg, 1917, 1917 *a*, 1916. The results in parentheses are by Boutin and Sanfourche, 1919.

Solubility of Ether in Aqueous Solutions of Sodium Chloride. (Thorne, 1921.)

The solutions were saturated by constant shaking for 3 1/2 to 4 hours.

The ether was determined by passing a current of dry air through a weighed amount of the saturated solution and calculating from the observed loss in weight.

Results at 15°.		Results at 25°.			
Gms. per 100 gms. sat. sol.		Gms per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
NaCl.	$(C_2H_5)_2O$.	NaCl.	$(C_2H_5)_2O$.	NaCl.	$(C_2H_5)_2O$.
0.0	8.43	8.75	3.20	0.0	6.05
0.91	8.10	11.08	2.32	0.91	5.96
1.033	7.73	14.16	1.55	2.837	4.78
2.30	6 67	16.24	1.11	5.970	3.41
3.307	5.81	21.58	0.577	7.812	2.57
5.881	4.37	23.18	0.454	11.08	1.88
7.198	3.91	26.52	0.309	15.79	0.979
				21.18	0.463
				24.90	0.309

The following results at 18° were obtained by Linde, 1917, 1926.

Gm mols. NaCl per liter...	0.0.	0.1.	0.2.	0.3.	0.4.	0.5.	0.6.	0.8.	1.0.
Gms $(C_2H_5)_2O$ per 100 cc. solvent...	7.88	7.66	7.20	6.84	6.48	6.12	5.78	5.19	4.62

von Euler and Svanberg, 1917, 1917 *a*, 1926, found 4 5 gms. $(C_2H_5)_2O$ per 100 cc. of aq. 1.0 normal Na Cl at 18°.

Solubility of Ether in Aqueous Solutions at 18°. (Linde, 1917, 1926.)

The determinations were made by rotating together in a sealed flask at 18°, 50 cc. of the solvent and such volumes of ether, that, after the period of rotation, not more than 0.5 cc. remained undissolved. The weight of dissolved ether was found by multiplying the volume by the $d_{18} = 0.716$.

Aqueous solvent.	Gms. $(C_2H_5)_2O$ per 100 cc. solvent.	Aqueous solvent.	Gms. $(C_2H_5)_2O$ per 100 cc. solvent.
0.1 *n* CH_3COONa	7.22	0.5 *n* Na_2SO_4	5.52
0.2 »	6.70	0.375 » + 0.125 *n* H_2SO_4	5.98
0.3 »	6.14	0.333 » + 0.166 »	6.16
0.4 »	5.58	0.3125 » + 0.1875 »	6.30
0.5 »	5.14	0.28125 » + 0.21875 »	6.45
0.6 »	4.73	0.2 » + 0.25 »	6.51
0.7 »	4.33	0.1875 » + 0.3125 »	6.81
0.8 »	4.06	0.125 » + 0.375 »	7.09
1.0 »	3.44	0.0625 » + 0.4375 »	7.26
0.1 *n* Sodium picrate	8.16	0.000 » + 0.5 »	7.56
0.5 » phenolate	5.59	0.5 »	5.50
0.5 » lactate	6.30	0.425 » + 0.075 *n* NaOH	5.53
0.25 » maleate	7.21	0.375 » + 0.125 »	5.55
0.75 *n* NaCl + 0.25 *n* CH_3COONa.	4.37	0.25 » + 0.25 »	5.50
0.5 » + 0.5 »	4.00	0.125 » + 0.375 »	5.55
0.25 » + 0.75 »	3.65	0.00 » + 0.500 »	5.56

von Euler and Svanberg, 1917, 1917 *a*, 1926, found 3.7 gms. $(C_2H_5)_2O$ per 100 cc. of 1.0 *n* Na_2SO_4 at 18° and 3.7 gms. $(C_2H_5)_2O$ per 100 cc. of 1.0 *n* CH_3COONa at 18°.

Data for the reciprocal solubility of ether and water at 15°, 20° and 25°, in solutions respectively saturated with succinic acid, are given by Forbes and Coolidge, 1919.

Freezing-Points of Mixtures of Ethyl Ether and Hydrochloric Acid.

(Hirai, 1926.)

t°.	Mol. $(C_2H_5)_2O$ per 100 mols. sat. sol.	Solid Phase.	t°.	Mols. $(C_2H_5)_2O$ per 100 mols. sat. sol.	Solid Phase.
—117.7..	100.0	$(C_2H_5)_2O$	— 87.4.....	36.29	$(C_2H_5)_2O.(HCl)_2$
—118.8..	89.16	»	— 87.3 m. pt..	33.33	»
—119.3..	86.93	»	— 89.0.....	31.70	»
—124.2..	79.68	»	— 93.5.....	27.39	»
—127.8..	77.33	»	—100.4.....	21.06	»
—126.5..	68.04	$(C_2H_5)_2O.(HCl)_2$	—104.0.....	18.76	»
—115.4..	63.66	»	—113.5.....	11.20	»
—110.9..	59.55	»	—115.5.....	10.55	»
—100.4..	52.13	»	—123.6.....	6.08	»
—100.9..	50.97	»	—123.7.....	5.70	HCl
—107.3..	47.18	»	—120.8.....	4.65	»
— 94.5..	44.84	»	—120.5.....	3.87	»
— 89.3..	38.24	»	—112.5.....	0.00	»

Freezing-point data for the systems $(C_2H_5)_2O.HBr + H_2O$ and $(C_2H_5)_2O.HBr + C_2H_5OH$ are given by Maass and Russel, 1919. Results for the system $(C_2H_5)_2O + H_3PO_4$ are given by Rubinowitsch and Jakubsohn, 1923.

Data for the solubility of mixtures of ethyl ether and kerosene and of ethyl ether and xylene in 92 wt. per cent ethyl alcohol at 20° are given by Ormandy and Craven, 1921.

ETHYL FORMATE $HCOOC_2H_5$.

FREEZING-POINTS OF MIXTURES OF ETHYL FORMATE AND TIN TETRACHLORIDE.
(Kournakov, Perelmoutor and Kanov, 1916.)

t°.	Mol. per cent $SnCl_4$.	t°.	Mol. per cent $SnCl_4$.	t°.	Mol. per cent $SnCl_4$.
—10.....	10.0	48.6	33.7	28.0.....	58.0
+15.....	20.0	47.1.....	36.0	24.0.....	65.0
33.5.....	25.9	45.5.....	38.3	20.0.....	73.0
46.0.....	30.5	44.0.....	40.0	16.0.....	80.0
48.0.....	31.8	38.2.....	46.0	10.0.....	90.0
49.0(m.pt.).	33.3	32.7.....	52.0	—33.0.....	100.0

The above results give the curve for the molecular compound $SnCl_4.2HCOO(C_2H_5)$.

ETHYL HYPOCHLORITE C_2H_5OCl.

DISTRIBUTION OF ETHYL HYPOCHLORITE BETWEEN WATER AND CARBON TETRACHLORIDE.
(Taylor, Mac Mullin and Gammal, 1925.)

Carbon tetrachloride containing ethyl hypochlorite was stirred with an equal volume of water untill equilibrium was reached, and samples of each layer were withdrawn and analyzed for available chlorine.

t°.	Mols. C_2H_5OCl per liter of CCl_4.	Mols. C_2H_5OCl per liter of H_2O.	t°.	Mols. C_2H_5OCl per liter of CCl_4.	Mols. C_2H_5OCl per liter of H_2O.
5.....	0.3355	0.0805	22.5.....	0.0637	0.0321
».....	0.1583	0.0541	36.0.....	0.3121	0.0759
».....	0.0690	0.0341	»	0.1642	0.0540
22.5.....	0.3499	0.08019	»	0.0692	0.0344
»	0.1997	0.0597			

ETHYL Methyl KETONE $CH_3.CO.C_2H_5$.

MUTUAL SOLUBILITY OF ETHYL METHYL KETONE AND GLYCEROL.
(Mc Ewen, 1923.)

The synthetic method was used. The temperatures were determined at which liquid phases separated from mixtures of known composition.

t°.	Wt. per cent $CH_3.CO.C_2H_5$.	t°.	Wt. per cent $CH_3.CO.C_2H_5$.	t°.	Wt. per cent $CH_3.CO.C_2H_5$.
37.5.....	4.0	162 5.....	36.17	161.5.....	67.14
116.5.....	10.21	163.2.....	41.27	150.0.....	74.78
128.5.....	13.21	164.5.....	53.84	118.5.....	86.55
155.5.....	26.75	164.5.....	60.25	55.5.....	92.14

Di ETHYL OXALATE $(COOC_2H_5)_2$.

Freezing-point data for mixtures of diethyl oxalate and hydroquinol, resorcinol and β naphthol are given by Kremann, Zechner and Drâzil, 1924.

ETHYL Hydrogen SULFATE $C_2H_5HSO_4$.

SOLUBILITY IN ETHYL ETHER CONTAINING FREE SULFURIC ACID AT 30°
(Hamid, Singh and Dunnicliff, 1926.)

Per cent free H_2SO_4.	Per cent $C_2H_5HSO_4$.	Per cent free H_2SO_4.	Per cent $C_2H_5HSO_4$.
0.092	1.125	0.372	0.722
0.152	1.061	0.516	0.509
0.186	0.999	0.533	0.470
0.314	0.818	4.06	0.242

By extrapolation the solubility of pure ethyl hydrogen sulfate in pure ether should be about 1.27 gms. $C_2H_5HSO_4$ per 100 gms. dry ether at 30°.

ββ′ Dichlor **ETHYL SULFIDE** (« Mustard Gas ») $S(CH_2.CH_2Cl)_2$

Solubility of « Mustard Gas » in Water.
(Boulin and Simon, 1920; Wilson, Fuller and Schur, 1922.)

B and S titrated the acidity of the aqueous solution immediately and after 24 hours and considered the results to show the amount of the compound which dissolved and afterwards decomposed. Approximate determinations in this manner, using cold water, gave 0.48 gm. S $(CH_2.CH_2Cl)_2$ per liter.

The rate of decomposition at temperatures of 20°, 50° and 100° was found to be approximately as 1 : 7.5 : 30. The effect of alkalis and of thiodiglycol on this decomposition was studied.

W, F and S shook « mustard gas » vigerously with water at 25° for 30 seconds and filtered the mixture during the next 20 seconds with the aid of suction. The result of several determinations was 0.0043 gm. mols or 0.684 gm. S $(CH_2CH_2Cl)_2$ per liter at 25°.

The Mutual Solubility of « Mustard Gas » and Ethyl Alcohol.
(Thompson, Black and Sohl, 1921,)

The synthetic method was used. The temperatures of complete solution and of clouding of known mixtures were determined.

Results with 92.5 % Alcohol.

t°.	Gms. $S(CH_2CH_2Cl)_2$ per 100 gms. of mixture.	t°.	Gms. $S(CH_2CH_2Cl)_2$ per 100 gms. of mixture.
5.1	21.64	34.4	65.27
12.8	26.20	35.2	68.67
17.0	30.26	35.8	72.45
21.7	33.91	36.7	75.22
25.6	38.70	37.6	78.20
28.3	42.80	37.9	81.42
29.9	46.47	38.6	84.93
30.6	49.66	38.5	86.80
31.4	52.29	38.4	88.75
31.0	54.45	37.8	90.80
32.5	56.76	35.7	92.93
33.0	59.37	30.9	95.18
33.6	62.18	19.9	97.53

Results with Absolute Alcohol.

t°.	Gms. $S(CH_2CH_2Cl)_2$ per 100 gms. of mixture.
5.6	44.83
7.5	47.45
9.1	50.39
10.6	53.73
11.8	57.59
12.2	61.91
13.6	67.00
14.2	71.75
14.8	75.76
15.5	80.25
15.6	83.12
15.3	87.13
14.8	91.04
14.5	93.13
13.6	95.31

Solubility of « Mustard Gas » in Gasoline, in Rail Road Light Oil and in Kerosene.
(Thompson and Odeen, 1926.)

Gasoline + $S(CH_2CH_2Cl)_2$.

t°.	Gms. $S(CH_2CH_2Cl)_2$ per 100 gms. of mixture.
4.2	30.08
4.5	30.14
9.0	36.46
9.5	36.51
13.5	46.21
14.0	46.32
18.7	53.49
20.4 (crit.t.	66.02
18.0	77.53
7.8	87.17
7.3	87.34

R. R. Light Oil + $S(CH_2CH_2Cl)_2$.

t°.	Gms. $S(CH_2CH_2Cl)_2$ per 100 gms. of mixture.
9.3	21.64
14.5	24.33
20.9	29.88
23.6	38.49
33.0	47.95
35.0	54.48
37.0 crit.t.	63.80
31.3	86.58
28.0	88.74
25.0	90.78

Kerosene — $S(CH_2CH_2Cl)_2$.

t°.	Gms. $S(CH_2CH_2Cl)_2$ per 100 gms. af mixture.
9.5	33.13
14.2	39.79
25.0	68.67
25.6 crit.t.	73.80
25.6	75.21
25.6	76.67
24.3	81.42
21.9	84.93
14.3	89.68
8.9	91.88

MUTUAL SOLUBILITY OF « MUSTARD GAS » AND LIGROIN.
(Thompson and Odeen, 1920.)

The ligroin boiled below 100° and had $d_{24} = 1.6677$.

t°.	Gms. $S(CH_2CH_2Cl)_2$ per 100 gms. mixture.	t°.	Gms. $S(CH_2CH_2Cl)_2$ per 100 gms. mixture.	t°.	Gms. $S(CH_2CH_2Cl)_2$ per 100 gms. mixture.
— 7.5.....	8.7	16.0.....	43.7	9.6.....	84.5
— 6.5.....	11.3	17.5.....	49.4	9.0.....	86.4
— 2.5.....	13.7	18.3.....	56.8	9.5.....	88.4
+ 0.2.....	16.1	19.0 (crit. t.).	61.4	10.0.....	90.5
2.5.....	24.2	19.0.....	66.7	12.0.....	95.1
6.5.....	27.8	17.22.....	76.1	13.0.....	97.4
10.3.....	32.5	14.0.....	80.9	13.0.....	100.0
14.5.....	39.3	12.0.....	82.6		

The authors also give data for the mutual solubility of chlorinated « Mustard Gas » and rail road light oil.

Freezing-point data for mixtures of « Mustard Gas » and sulfur are given by Wilkinson, Neilson and Wylde, 1920.

ETHYL URETHAN (Ethyl carbamate) $NH_2COO.C_2H_5$ (see also Urethan).

100 gms. sat. sol. in water contain 48.0 gms. $NH_2CO.O.C_2H_5$ at 15.05.
(Führer, 1924.)

ETHYLENE C_2H_4.

100 cc. of H_2O dissolve 11.6 cc. (reduced to 0° of 760mm) ethylene at 21°.
(Venable and Fuwa, 1922.)

1.0 cc. of absolute ethyl alcohol dissolves at t° (pressure not stated) $3.59498 - 0.057716\ t + 0.0006812\ t^2$ cc. of ethylene. (Spörry, 1922. 1926.)

100 cc. of rubber dissolve 141.0 cc. (reduced to 0° of 760 mm.) ethylene at 21°.
(Venable and Fuwa, 1922.)

ETHYLENE OXIDE C_2H_4O.

FREEZING-POINTS OF MIXTURES OF ETHYLENE OXIDE AND WATER.
(Maass and Boomer, 1922.)

t°.	Per cent C_2H_4O.	t°.	Per cent C_2H_4O.	t°.	Per cent C_2H_4O.
— 0.2...	6.0	10.5...	34.0	7.2...	63.5
— 6.7...	11.4	10.0...	40.8	6.9...	65.5
9.4...	16.4	9.5...	46.0	6.0...	70.5
10.1...	21.3	9.0...	51.0	4.3...	78.5
10.7...	24.9	8.4...	55.0	— 0.9...	92.0
10.7...	28.0	7.5...	62.0	—111.3...	100.0

EUGENOL BENZOATE $C_6H_3(1)(CH_2.CH:CH_2)(3)OCH_3(4)OC_7H_5O$.

Freezing-points of mixtures of eugenol benzoate and isoeugenol benzoate are given by Mc Kie, 1921.

FATS (See also Oils p. 1322).

SOLUBILITY OF COCOANUT AND PALM KERNAL OIL IN ALCOHOL AND IN ACETIC ACID
(Van Kregten, 1919, 1920.)

Solvent.	Per cent Concentration of solvent.	Critical solution temp. for Cocoa nut oil.	Critical solution temp. for Palm kernal oil.
Ethyl Alcohol of $d_{\frac{15}{15}} = 0.7942$.....	99.96	20.2	28.7
» » » = 0.7981.....	99.16	30	38.8
» » » = 0.8001.....	98.75	35.5	44.2
» » » = 0.8020.....	98.36	39.5	47.9
Acetic Acid » = 1.0573.....	99.05	17.9	32.5
» » » = 1.0579.....	99.05	26.0	41.5
» » » = 1.0584.....	98.85	30.9	46.5

1 gm. of oil + 5 cc. of solvent were employed for each determination. The cocoanut oil contained 0.032 %, of fatty acids and the palm kernel oil, 0.060 per cent. The critical solution temperatures of various mixtures of the two oils are also given.

Critical Solution Temperatures of Fats and Oils in Glacial Acetic Acid.

(Grimme, 1919, 1920.)

When a solution of a fat in a suitable solvent cools, it is observed that at a given temperature, which depends both upon the solvent and the nature of the selected fat, a sudden cloudiness of the solution develops. The temperature at which this takes place is the Critical solution temperature. The author gives a review of previous work upon this determination and subjects the method to a critical study. He used glacial acetic acid instead of alcohol in order to be able to work with open tubes instead of closed ones. He also tested the effect of cooling with and without an air bath. It was found that a bath of glycerol cooled so slowly that too much time was required for the determinations.

	Critical temperature of solution using:			
	1.0 part of oil +2.0 parts CH_3COOH.		1.0 part of oil +1.0 part CH_3COOH.	
Oil or Fat used.	Without air bath.	With air bath.	Without air bath.	With air bath.
Apricot oil	90.0	97.5	91.5	92.0
Pea nut oil	71.0	71.5	93.5	91.25
Almond oil	100.0	102.0	97.5	100.5
Olive oil	45.5	45.0	72.5	73.5
Adansonia oil	85.0	88.5	92.5	92.5
Seed oil	79.0	82.5	100.0	102.0
Cotton seed oil	87.5	80.0	96.5	96.75
Rape seed oil	104.0	104.0	98.5	96.5
Sesame oil	86.5	87.5	96.5	95.0
Rice oil	85.5	85.0	89.0	88.0
Wood oil	85.0	81.5	94.5	97.5
Flax seed oil	93.0	92.0	102.5	102.0
Indian laurel oil	52.0	51.5	61.5	61.5
Marotti oil	72.0	84.5	88.5	87.0
Palm oil (Kamaroon)	76.0	78.0	87.0	87.0
» » (Togo)	77.0	74.5	88.5	85.5
Cocoa butter	66.0	62.0	65.5	68.0
» »	64.0	63.0	69.0	68.5
» » (old)	66.0	62.5	70.5	65.0
Cocoa nut fat	39.0	44.5	60.0	60.0
Butter fat	64.0	65.0	68.5	68.0
Cod liver oil	79.5	78.5	88.5	86.5
Beef tallow	80.5	79.5	96.0	97.5
Hog lard	94.0	94.0	94.0	95.0

FENCHON $C_{10}H_{16}O$.

Freezing-point data for mixtures of fenchon and each of the following compounds are given by Kremann and Dietrich, 1923. Phenol, α and β naphtol, pyrocatechol, resorcinol, hydroquinol, pyrogallol, *o* and *p* nitrophenol, picric acid and 1.2.4 dinitro phenol.

FLUORENE (Diphenylene methane) $C_6H_4.CH_2C_6H_4$.

Freezing-point data are given for :

Fluorene + β Naphthylamine (Pfeiffer, 1924.)
» + 1.2.6, 1.3.4 and 1.3.5 dinitro toluene (Kremann, Hönigsberg and Mauermann, 1923.)
» + Picryl chloride $[C_6H_2Cl(NO_2)_3]$ (Efremov, 1918.)
» + Picramide $[C_6H_2NH_2(NO_2)_3]$ » »
» + Styphnic acid $[2.4.6C_6H(OH)_2(NO_2)_3]$ (Efremov, 1919*a*.)
» + Quinone (Kremann. Sutter, Sitte, Strzelba and Dobotzky, 1922.)

Solubility of Fluorene in Several Solvents. (Mortimer, 1923.)

Mols. $C_6H_4.CH_2.C_6H_4$ per 100 mols. of saturated solution in

t°.	Ethylene dichloride.	Chloro benzene.	Nitro benzene.	*p* xylene.	Toluene.	Benzene.	Pyridine.
0....	7.1	6.6	6.3	5.5	5.4	5.4	5.1
20....	12.9	12.4	11.8	11.2	10.6	10.5	10.1
40....	22.0	21.4	20.6	19.3	19.1	19.0	18.3
60....	35.6	34.9	34.1	32.7	32.4	32.4	31.4
80....	54.1	53.3	52.5	51.3	51.1	51.1	49.9
100....	78.4	78.2	77.1	76.6	76.5	—	75.5

Mols. $C_6H_4.CH_2.C_6H_4$ per 100 mols. of saturated solution in

t°.	Carbon tetra chloride.	Aniline.	Acetone.	Acetic acid.	Ethyl acohol.	Methyl alcohol.
0.....	3.7	2.4	2.0	—	—	—
20.....	7.8	5.6	4.7	0.8	0.50	0.35
40.....	15.1	11.7	10.4	1.9	0.85	0.58
60.....	27.5	23.2	15.0 (50°)	4.5	1.76	1.10
80.....	—	42.7	—	11.3	4.60	—
100.....	—	71.0	—	40.0	—	—

FORMIC ACID HCOOH.

Solubility of Formic Acid in Various Solvents at 25° and Vice Versa. (Gordon and Reid, 1922.)

The mixtures were constantly shaken at 25° for 4 hours. After separation of the two layers, the formic acid in a weighed amount of each was determined by titration. The weight of the other constituent was calculated by difference.

Solubility of Formic Acid in Various Solvents.

Solvent.	Gms. HCOOH per 100 gms. solvent.
Benzene	14.40
Bromoform	2.45
Carbon disulfide	1.28
Carbon tetra chloride	3.43
Cotton seed oil	8.68
Kerosene	0.897
Toluene	11.04
Xylene	8.74

Solubility of Various Compounds in Anhydrous Formic Acid.

Compound.	Gms. compound per 100 gms. HCOOH
Benzene	15.14
Bromoform	25.3
Carbon disulfide	4.66
Carbon tetra chloride	6.95
Cotton seed oil	0.77
Kerosene	1.56
Toluene	9.08
Xylene	7.29

Distribution of Formic Acid at 25° Between :

Water and Benzene.

(Brown and Bury, 1923.)

Normality of HCOOH in	
H_2O layer.	C_6H_6 layer.
3.400	0.0117
3.757	0.0138
3.933	0.0147
4 689	0.0188
5.483	0.0233
6.806	0.0348

(Gordon and Reid, 1922.)

Gms. HCOOH per 100 gms.	
H_2O layer.	C_6H_6 layer.
5.3	0.0170
6.4	0.0197
9.9	0.0400
13.6	0.0584
18.5	0.0840
29.2	0.156
41.2	0.322
58.2	0.800

Water and Bromoform.

(Gordon and Reid, 1922.)

Gms. HCOOH per 100 gms.	
H_2O layer.	$CHBr_3$ layer.
3.1	0.114
6.9	0.180
10.8	0.176
23.1	0.394
39.0	0.675
53.6	1.195

DISTRIBUTION OF FORMIC ACID AT 25° BETWEEN : (Gordon and Reid, 1922.)

Water and Carbon Disulfide.		Water and Carbon Tetrachloride.		Water and Cotton Seed Oil.			
Gms. H COO H per 100 gms.		Gms. H COO H per 100 gms.		Gms. H COO H per 100 gms.		Gms. H COO H per 100 gms.	
H_2O layer.	CS_2 layer.	H_2O layer.	CCl_4 layer.	H_2O layer.	C.S.O. layer.	H_2O layer.	C. S. O. layer.
4.8	0.00318	5.8	0.00378	1.1	0.0172	20.9	0.331
8.4	0.00574	8.6	0.0081	2.3	0.036	30.3	0.489
14.6	0.0105	17.5	0.01135	3.7	0.057	51.1	1.10
25.7	0.0215	26.9	0.0273	5.5	0.0878	62.5	1.67
41.6	0.0438	43.2	0.0631	8.1	0.1305	71.3	2.43
54.8	0.0750	58.9	0.1700	12.7	0.193	80.7	3.50
				14.4	0.220	87.2	4.86

The average value for the distribution of formic acid between water and chloroform at 25° was found by Smith, 1921-1922, to be 32.2 millimols H CO OH per liter of the H_2O layer and 1.0 millimol per liter of the $CH Cl_3$ layer.

DISTRIBUTION OF FORMIC ACID BETWEEN WATER AND ETHER

at 15°. (Pinnow, 1919, 1922.)			at 26°.3. (Pinnow, 1919, 1922.)			at 25°. (Smith, 1921, 1922.) Millimols H COO H per liter		
Conc. of H CO OH in			Conc. of H COO H in					
H_2O layer (1).	$(C_2H_5)_2O$ layer (2).	$\frac{(1)}{(2)}$.	H_2O layer (1).	$(C_2H_5)_2O$ layer (2).	$\frac{(1)}{(2)}$.	H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_1}{C_2}$.
1.154	0.526	2.19	1.245	0.488	2.51	30.00	13.25	2.26
0.619	0.274	2.26	0.663	0.245	2.71	13.45	4.75	2.77
0.322	0.134	2.40	0.394	0.142	2.77	8.85	3.25	2.72
0.146	0.0584	2.50	0.158	0.0561	2.82	6.55	2.30	2.85
0.0976	0.0386	2.51				4.775	1.625	2.94
0.0523	0.0210	2.49						

DISTRIBUTION OF FORMIC ACID BETWEEN WATER AND ETHER AT 18°.
(Auerbach and Zeglin, 1922.)

Gm. mols. H COO H per liter of			Gm. mols. H COO H per liter of		
H_2O layer (1).	$(C_2H_5)_2O$ layer (2).	$\frac{(1)}{(2)}$.	H_2O layer (1).	$(C_2H_5)_2O$ layer (2).	$\frac{(1)}{(2)}$.
0.0476	0.0176	2.53	0.3695	0.1477	2.44
0.0499	0.0185	2.52	0.5090	0.2074	2.41
0.0960	0.0364	2.52	0.6782	0.2799	2.38
0.1036	0.0394	2.52	0.8358	0.3494	2.33
0.1954	0.0756	2.50	1.058	0.4531	2.30
0.2868	0.1131	2.47	1.349	0.6068	2.20

DISTRIBUTION OF FORMIC ACID BETWEEN AQUEOUS 0.5 *n* SULFURIC ACID SOLUTIONS AND ETHER AT 18°. (Auerbach and Zeglin, 1922.)

Gm. mols. H COO H per liter of			Gm. mols. H COO H per liter of		
0.5 *n* H_2SO_4 layer (1).	$(C_2H_5)_2O$ layer (2).	$\frac{(1)}{(2)}$.	0.5 *n* H_2SO_4 layer (1).	$(C_2H_5)_2O$ layer (2).	$\frac{(1)}{(2)}$.
0.0501	0.0200	2.50	0.4786	0.2003	2.39
0.0928	0.0373	2.49	0.4930	0.2070	2.38
0.1710	0.0694	2.47	0.6724	0.2888	2.33
0.1964	0.0803	2.45	0.8517	0.3732	2.28
0.3164	0.1302	2.43	0.8890	0.3913	2.27
0.3455	0.1426	2.42	1.268	0.5834	2.17
0.4061	0.1687	2.41	1.320	0.6116	2.16

Data for the distribution of formic acid between ether and aq. 0.5 *n* H_2SO_4 containing 200 gms. of glucose per liter, are given by Auerbach and Beck, 1926. The experiments were made for the purpose of perfecting a method for the determination of formic acid in sugar containing foodstuffs such as honey, fruit juices and marmalades.

DISTRIBUTION OF FORMIC ACID AT 25° BETWEEN :
(Gordon and Reid, 1922.)

Water and Kerosene.		Water and Toluene.		Water and Xylene			
Gms. HCOOH per 100 gms.		Gms. HCOOH per 100 gms.		Gms. HCOOH per 100 gms.		Gms. HCOOH per 100 gms.	
H_2O layer.	Kerosene layer.	H_2O layer.	Toluene layer.	H_2O layer.	Xylene layer.	H_2O layer.	Xylene layer.
17.9	0.0099	5.3	0.0149	5.0	0.0208	25.6	0.1155
30.9	0.0218	7.9	0.0246	5.1	0.0238	26.4	0.1120
38.9	0.0329	16.5	0.0566	8.6	0.0421	40.4	0.223
43.2	0.0415	31.0	0.1375	9.6	0.0420	41.2	0.254
59.8	0.126	41.7	0.270	15.0	0.0572	55.2	0.500
66.3	0.173	59.7	0.726	15.6	0.0556	55.7	0.493
						60.3	0.661

DISTRIBUTION OF FORMIC ACID AT 25° BETWEEN ACETONE AND GLYCEROL.
(Smith, 1921-1922.)

Millimols. HCOOH per liter of		
Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
2.075	1.525	1.36
2.8875	2.0625	1.40
5.65	3.70	1.39
7.8	5.65	1.38
20.8	16.0	1.30

Freezing-point data for mixtures of formic acid and formates of ammonium, calcium, lead, lithium, potassium and sodium are given by Kendall and Adler, 1921.

FUMARAMIDE $CONH_2.CH:CH.CONH_2$.

100 cc. H_2O dissolve 0.146 gm. fumaramide at 50°. (Viseur, 1926.)

FUMARIC ACID COOH.CH:CH.COOH.

MALEIC ACID COOH.CH:CH.COOH (See also p. 1289).

SOLUBILITY OF EACH, DETERMINED SEPARATELY, IN SEVERAL SOLVENTS.
(Weiss and Downs, 1923.)

Solvent.	t°.	Gms. per 100 gms. solvent	
		Fumaric acid.	Maleic acid.
Water	25	0.70	78.8
»	40	1.07	112.5
»	60	2.4	148.7
»	100	9.8	392.6 (97°.5)
95 % Ethyl alcohol	29.7	5.75	69.9
Ethyl Ether	25	0.72	8.19
Chloroform	25	0.02	0.011
Carbon Tetrachloride	25	0.027	0.002
Benzene	25	0.003	0.024
Acetone	29.7	1.72	35.77
Xylene	29.7	0.027	0.0085
Coal tar (heavy solvent)	29.7	0.0343	0.0085
Acetone	20	1.29	25.01 (Viseur, 1926.)
Acetylene dichloride (trans) (b. pt. 48°.3).	40	0.002	0.076 (Lebrun, 1925)
» « (cis) (» 60°.2).	40	0.002	0.049 »
Crotonic Nitrile (b. pt. 107°.7–108°.2)	50	0.076 (30°)	5.80 »
» » (» 121°.8–122°.2)	50	0.034	4.58 »

Data for the solubility of fumaric acid in acetone solutions of maleic acid at 20° and vice versa, and for the solubility of fumaric and maleic acids in acetone solutions of succinic acid at 20° and vice versa are given by Viseur, 1926.

DISTRIBUTION OF FUMARIC ACID AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Ether. Millimols. $(CH)_2(COOH)_2$ per liter.			Acetone and Glycerol. Millimols. $(CH)_2(COOH)_2$ per liter.		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
1.01875	0.4625	0.454	0.730	0.6350	0.870
1.5125	0.8375	0.554	1.3375	1.1875	0.888
2.60	1.70	0.654	2.225	2.125	0.954
4.80	3.50	0.729	5.275	5.175	0.981
8.85	6.75	0.763			

Freezing-point data for various binary mixtures composed of fumaric acid, maleic acid, succinic acid, methyl and ethyl fumarates, maleates and succinates, fumaride, succinamide and maleic diamide are given by Viseur, 1926.

FURFURAL $C_4H_3O.CHO$.

RECIPROCAL SOLUBILITY OF FURFURAL AND WATER.
(Mains, 1922; Evans and Aylesworth, 1926.)

The determinations of Mains were made by shaking together furfural and water at nearly constant temperature for 100 times. After separation, the two layers were analyzed by measurement of their densities and comparing with a concentration-density chart. The determinations of Evans and Aylesworth were made by the sealed tube synthetic method and precautions were taken to secure the highest accuracy.

Results of Mains.

	Gms. $C_4H_3O.CHO$ per 100 gms.	
t°.	Water rich layer.	Furfural rich layer.
10.....	7.9	96.1
20.....	8.3	95.2
30.....	8.8	94.2
40.....	9.5	93.3
50.....	10.4	92.4
60.....	11.7	91.4
70.....	13.2	90.3
80.....	14.8	88.7
90.....	16.6	86.7
97.9 (b. t.).	18.4	84.1

Results of Evans and Aylesworth.

	Gms. $C_4H_3O.CHO$ per 100 gms.	
t°.	Water rich layer.	Furfural rich layer.
50.....	9.2	92.2
60.....	10.5	90.9
70.....	12.2	89.1
80.....	14.1	87.2
90.....	16.5	84.9
100.....	19.6	81.8
110.....	25.0	76.5
120.....	40.5	61.0
120.9 (crit. t.)..	50.7	

Oxymethyl FURFURAL $C_6H_6O_3$.

FREEZING-POINTS OF MIXTURES OF OXYMETHYL FURFURAL AND WATER.
(Mildendorp, 1919.)

The compound was shown to have the structural formula $HO.H_2C—C(=CH—CH=C)—C.OH$, with the furan ring oxygen between the two carbons bearing the CH and CH$_2$OH groups.

It distills at 114-116°, at 1 mm. pressure, yielding a liquid of $d_{\frac{15}{15}} = 1.268$. At very low temperatures it yields crystals of m. pt. 31°.5. It is soluble in all proportions in water. The following results for the f. pts. of its mixtures with water were obtained.

t° of f. pt.	Mol. per cent $C_6H_6O_3$ in mixture.	t° of f. pt.	Mol. per cent $C_6H_6O_3$ in mixture.	t° of f. pt.	Mol. per cent $C_6H_6O_3$ in mixture.
31.5.....	100	9.85.....	52.2	—4.5 (Eutec.).	21.3
27.0.....	90.8	8.95.....	49.9	—3.25.....	17.8
24.3.....	84	7.35.....	46.4	—2.95.....	15.3
20.2.....	75	4.55.....	41.6	—2.4.....	11.1
17.6.....	69.1	3.55.....	38.0	—2.24.....	9.4
15.2.....	64.1	1.6.....	34.6	—1.5.....	5.0
13.05.....	59.4	—0.4.....	30.9	0.0.....	0.0
10.95.....	55.4	—2.2.....	25.9		

GADOLINIUM ACETATE $Gd(CH_3COO)_3.4H_2O$.

100 gms. sat. sol. of gadolinium acetate in water contain 10.37 gm. Gd $(CH_3COO)_3$ at 25°. (Meyer and Müller, 1920.)

GADOLINIUM LACTATE $Gd(C_3H_5O_3)_3.1\frac{1}{2}H_2O$.

100 gms. sat. sol. of gadolinium lactate in water contain 0.154 gms. Gd_2O_3, equivalent to 3.833 gms. Gd $(C_3H_5O_3)_3.1\ 1/2\ H_2O$, at 20°. (Jantsch, 1926.)

GALLIC ACID $3.4.5(OH)_3.C_6H_2.COOH.H_2O$.

DISTRIBUTION OF GALLIC ACID AT 25° BETWEEN: (Smith, 1921–1922.)

Water and Ether. Millimols. per liter			Acetone and Glycerol. Millimols. per liter		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
2.82	1.27	0.451	0.8625	2.45	0.352
8.25	3.72	0.452	2.325	6.625	0.351
15.75	7.13	0.452	4.45	12.85	0.346
35.2	16.10	0.457	9.55	29.85	0.320
59.5	27.0	0.453			

GALLIC ALDEHYDE $3.4.5.(OH)_3C_6H_2CHO.H_2O$.

100 gms. H_2O dissolve 0.1 gm. aldehyde at 0° and 5.8 gms. at 50°. (Rosenmund and Zetzsche, 1918.)

GALLIUM HYDROXIDE $Ga(OH)_3$.

SOLUBILITY OF GALLIUM HYDROXIDE IN AQUEOUS SOLUTIONS OF SODIUM HYDROXIDE AT 18–20°. (Fricke and Blencke, 1925.)

Normality of aq. NaOH.	Gms. Ga_2O_3 per 100 cc. sat. sol.	Normality of aq. NaOH.	Gms. Ga_2O_3 per 100 cc. sat. sol.
1.39	0.77	11.01	7.12
3.65	2.01	11.49	5.98
7.57	4.24	12.68	4.28
9.61	7.01	12.75	4.65
10.34	9.02	15.24	2.94
10.37	8.83	15.37	2.26

GALLIUM SELENATE $Ga_2(SeO_4)_3.22H_2O$.

An excess of air dried gallium selenate was added to water and the mixture kept at 25° for 6 hours. Constant shaking is not mentioned. Samples of the clear supernatant solution were weighed and their content of gallium determined by the sodium sulfite method.

100 gms. of the saturated solution contained 12.05 gms. Ga_2O_3 at 25°. (Dennis and Bridgman, 1918.)

GASOLINE (Petrol, Essence) See also Heptane and Hexane.

SOLUBILITY OF MOTOR GASOLINE (66° Be) AND CASING HEAD GASOLINE (81° Be) IN WATER AT 25°. (Milligan, 1924.)

Gasoline vapor mixed with air was shaken for 2 minutes with distilled water previously saturated with air. The mixture was analyzed by means of a Haldane gas analysis apparatus before and after contact with water, and the amount of gasoline dissolved by the water found by difference. The solubility coefficient α_{25} represents the volume of gas (reduced to 0°) which dissolves in one volume of water at 25° when the pressure of the gas over the water is 760 mm.

Using motor gasoline (66° Be) of average composition C_7H_{16} (Heptane) the result was $\alpha_{25} = 0.017$.

Using casing head gasaline (81° Be) of average composition C_6H_{14} (Hexane) the result was $\alpha_{25} = 0.012$.

From these values for gasoline vapors, corresponding in composition to heptane and hexane, the solubility of liquid heptane and hexane in water at 25° was calculated to be approximately 0.0007 and 0.0014 volumes, respectively, per 100 volumes of H_2O.

SOLUBILITY OF MIXTURES OF GASOLINE AND BENZENE AND OF GASOLINE AND XYLENE IN 92 WT. PER CENT ETHYL ALCOHOL AT 20°. (Ormandy and Craven, 1921.)

Gasoline + Benzene Mixtures.		Gasoline + Xylene Mixtures.			
Vol. % C_6H_6 in mixture.	Gms. mixture per 100 gms. sat. sol. in 92 wt. % alcohol.	Vol. % $C_6H_4(CH_3)_2$ in mixture.	Gms. mixture per 100 gms. sat. sol. in 92 wt. % alcohol.	Vol. % $C_6H_4(CH_3)_2$ in mixture.	Gms. mixture per 100 gms. sat sol. in 92 wt. % alcohol.
15	63.4	0.0 (=Gasoline)	37.3	55.6	77.6
30	81.4	7.7	42.5	62.5	79.0
40	84.9	25.0	63.1	71.4	80.2
50	87.3	33.3	70.0	76.9	80.9
60	88.3	41.7	73.7	83.3	81.4
80	90.3	45.4	74.8	90.0	82.3
100	93.1	50.0	76.2	100.0	84.6

Similar results for mixtures of ether and xylene and ether and kerosene are also given.

GELATIN.

SOLUBILITY OF GELATIN IN WATER AND IN AQUEOUS SOLUTIONS OF ACIDS AND BASES AT 15°-17°. (Fairbrother and Swan, 1922.)

One gram quantities of gelatin in 3/4 inch squares were place in conical flasks of 250 cc. capacity together with a few crystals of thymol and 100 cc. of the aqueous solution. The flasks were shaken gently once each day for ten days. The supernatant liquid was filtered through paper and the first two 20 cc. portions of filtrate were rejected. The third 20 cc. portion was neutralized, using methyl red as indicator. It was diluted to 40 cc. with H_2O and 20 cc. of a 1 % solution of tannin were added The precipitate was kept at 0° for 1/2 hour, filtered upon a tared filter, washed with water to remove excess of tannin and then dried at 100° and at 105° and weighed. The method was controlled by means of determinations upon quantities of gelatin between 0.001 and 0.080 gm. per 20 cc. The sample of gelatin employed for the solubility determinations was Coignet's Gelatin Extra (Gold Label). It contained 2.24 % of ash, 16.7 % H_2O and a 1 % solution had p_H = 5.6 at 20°.

SOLUBILITY IN WATER :

t°.....	0°.	15°-17°.	18°.3.	22°.
Gm. dry gelatin per 100 cc. sat. sol.....	0.02	0.05	0.07	0.10

SOLUBILITY IN AQUEOUS SOLUTIONS OF :

Hydrochloric Acid.			Sulfuric Acid.		
Concentration of HCl mols. per liter		Gm. Gelatin per 100 cc. final liquor.	Concentration of H_2SO_4 mols per liter		Gm. Gelatin per 100 cc. final liquor.
Initial.	Final.		Initial.	Final.	
0.0002	–	0.03	0.0000	–	0.06
0.0010	–	0.01	0.0001	–	0.04
0.0020	0.0006	0.02	0.0005	–	0.03
0.0050	0.0009	0.03	0.0010	0.0002	0.04
0.0067	0.0019	0.05	0.0025	0.0005	0.07
0.0100	0.0038	0.06	0.005	0.0016	0.07
0.0200	0.0134	0.08	0.010	0.0063	0.09
0.050	0.045	0.10	0.025	0.0219	0.11
0.100	0.097	0.14	0.050	0.0472	0.14
0.200	0.1986	0.24	0.100	0.0995	0.23
0.500	..	1.00 (= all)	0.250	–	1.00 (= all)

SOLUBILITY OF GELATIN AT 15-17° IN AQUEOUS SOLUTIONS OF :

Nitric Acid.

Concentration of HNO_3 mols. per liter		Gms. gelatin per 100 cc. final liquor.
Initial.	Final.	
0.0000	—	0.04
0.0002	—	0.05
0.0010	—	0.05
0.0020	0.0005	0.04
0.0051	0.0013	0.05
0.0102	0.0049	0.07
0.0205	0.0152	0.09
0.0512	0.0461	0.12
0.1024	0.0985	0.14
0.2048	0.2019	0.21
0.5125*	—	1.00 (= all)

Acetic Acid.

Concentration of CH_3COOH mols. per liter		Gms. gelatin per 100 cc. final liquor.
Initial.	Final.	
0.0002	—	0.05
0.0010	—	0.04
0.0020	0.0005	0.05
0.0050	0.0027	0.05
0.0100	0.0072	0.06
0.0200	0.0152	0.06
0.050	0.0401	0.06
0.100	0.0821	0.07
0.200	0.1675	0.09
0.500	0.422	0.14
5.000	—	1.00 (= all)

* The gelatin in this solution gave a turbid red liquid, probably due to the xanthoproteic reaction.

Potassium Hydroxyde.

Concentration of KOH mols. per liter		Gms. gelatin per 100 cc. final liquor.
Initial.	Final.	
0.0010	—	0.06
0.0050	0.0016	0.07
0.0062	0.0024	0.07
0.0100	0.0052	0.10
0.0125	0.0066	0.12
0.0211	0.0137	0.19
0.025	0.0178	0.21
0.050	0.0397	0.42
0.100	—	1.00 (= all)

Sodium Hydroxyde.

Concentration of NaOH mols. per liter		Gms. gelatin per 100 cc. final liquor.
Initial.	Final.	
0.0000	—	0.05
0.0020	—	0.05
0.0050	0.0017	0.06
0.00625	0.0024	0.07
0.0100	0.0049	0.08
0.0125	0.0068	0.11
0.020	0.0135	0.18
0.025	0.0188	0.22
1.050	—	1.00 (= all)

GENTISIC ACID (2.5 dihydroxy benzoic acid) $2.5\,(OH)_2C_6H_3COOH$.

DISTRIBUTION OF GENTISIC ACID AT 25° BETWEEN :

(Smith, 1921-1922.)

Water and Chloroform.

Millimols. per liter		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
15.20	0.32	0.0210
20.70	0.45	0.0217
38.40	0.90	0.0234

Water and Ether.

Millimols. per liter		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.31	1.205	3.89
0.41	2.07	5.05
0.60	3.98	6.64
0.83	7.65	9.22
1.12	11.92	10.65

Water and Xylene.

Millimols. per liter		
H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
23.55	0.40	0.017
30.50	0.61	0.020
37.50	0.95	0.024

GLASS.

Data for the solubility of powdered glasses in water and in dilute acids are given by Nicolardot, 1914. It was found that the extent of the action of the solvent depended upon the fineness of the powder. All of the glasses were attacked more by dilute H Cl than by water. The results are expressed in terms of the weight lost by 1000 gms. of glass subjected to treatment by an arbitrary procedure.

GLIADIN.

Solubility of Gliadin in Aqueous Solutions of Acids at 25°.

(Tague, 1925.)

The gliadin was prepared from wheat flour by the method of Osborne. One gram per 100 cc. of aqueous acid, containing 5 drops of toluene, were constantly shaken for 8 hours. The mixture was allowed to stand over night and the nitrogen determined in 100 cc. of the clear filtrate. The factor 5.7 was used to convert nitrogen to gliadin.

Normality of aq. acid solution.	Grams of Gliadin per 100 cc. of sat. solution in aq.		
	H Cl.	H_2SO_4.	CH_3COOH.
1.0	0.0550	0.0632	0.1733
0.1	0.0661	0.0741	0.1654
0.01	0.1397	0.1208	0.1309
0.001	0.1357	0.1265	0.1117
0.0001	0.0966	0.0890	0.0816
0.00001	0.0700	0.0716	0.0761

Since the method of preparation and purification has a great deal to do with the physical and chemical characteristics of proteins, the author determined the solubility in aqueous H Cl, of three samples of gliadin prepared by slight modifications of the method of preparation.

Normality of aqueous H Cl.	Gms. Gliadin per 100 cc. sat. solution		
	Sample N° 1.	Sample N° 2.	Sample N° 3.
1.0	0.0496	0.0550	0.0442
0.1	0.0584	0.0600	0.0613
0.01	0.3554	0.1297	0.2428
0.001	0.3348	0.1254	0.1972
0.0001	0.1699	0.1083	0.0452
0.00001	0.0923	0.0938	0.0262

The author also gives data which show that :

Moist gliadin is about twice as soluble as dry gliadin.

The amount of gliadin dissolved varies directly with the amount of excess of solid material used for preparing the saturated solution. With 5.0 gms. per 100 cc of solvent there is from 3 to 4 times as much dissolved as when 1.0 gm. per 100 cc. is used.

The solubility increases with time of shaking up to about 72 hours.

The maximum solubility occurs at p_H 2 to 3 and the minimum at p_H 6.5.

Gliadin is slightly soluble in aqueous sodium carbonate solution, with maximum at about 0.009 molar.

The solubility in aqueous solutions of neutral salts is only about 0.001 gm. per 100 cc., except with $MgCl_2$ solutions, in which it may reach 0.084 gm. per 100 cc. in concentrated solutions.

Gliadin in quite soluble in aqueous methyl alcohol; the maximum being 0.1322 gms. per 100 cc. in alcohol of 70 volume per cent.

Solubility of Gliadin in Aqueous Solutions of Ethyl Alcohol.

(Dill and Alsberg, 1925.)

Solutions of gliadin and the solvent in sealed tubes warmed to 50°, were cooled very gradually and the temperature observed at which turbidity appeared. For each solvent this temperature was practically independant of the gliadin concentration.

Concentration of Gliadin in gms. per 100 gms solution.	Temp. of appearance of Turbidity in aq. Alcohol of		
	50 Vol. per cent.	60 Vol. per cent.	70 Vol. per cent.
0.1 to 0.2	−3°	−1° to −2°	0° to −2°
0.4 to 25.0	+5° to +8°	−1° to +2°	+3° to +8°

TURBIDITY TEMPERATURES OF 2.5 PER CENT GLIADIN SOLUTIONS IN AQUEOUS MIXTURES OF ETHYL, METHYL AND *n* PROPYL ALCOHOLS.

(Dill and Alsberg, 1925.)

Determinations were made with five different samples of gliadin, and for one of these samples, with the three different alcohols. In every case the amount of gliadin present was the same, namely, 2.5 gms. per 100 gms. of the solution.

	Temperatures at which turbidity appeared in 2.5 per cent solutions of						
Vol. per cent of Alcohol.	Gliadin No.1 in aq. C_2H_5OH.	Gliadin No.2A in aq. C_2H_5OH.	Gliadin No.2B in aq. C_2H_5OH.	Gliadin No.3B in aq. C_2H_5OH.	Gliadin No.3A in aq. C_2H_5OH.	Gliadin No.3A in aq. CH_3OH.	Gliadin No.3A in aq. *n* C_3H_7OH.
5.0	—	—	—	—	66	70+	70+
7.5	—	—	—	—	56	70	—
10.0	—	—	—	—	44	58	28
20.0	—	—	—	—	33	43	17
30	33	29	32	27	24	34	6
40	23	19	21	18	16	26	—3
50	13	9.5	12	9	7.5	21	—6.5
55	11	7	10	6.5	4	—	—6
60	8.5	4.5	7.5	5.5	2	13	—3
65	10	5.5	9	6	2.5	10	—
70	15	9.5	13	11	5	12	14
80	41	35	38	35.5	31	19	61
82.5	—	—	—	—	41	—	70+
85	—	—	—	—	55	29	—
90	—	—	—	—	70+	70+	—

« The phenomenon appears to be one of peptization rather than of true solution ». The authors also give determinations of the solubility (peptization) of gliadin in aqueous solutions of other compounds. The results show the minimum concentration (mols. per liter) of each compound in water, capable of holding gliadin in solution at 20°, as determined by dilution. KSCN, 1.06; NH_4SCN, 1.09; KI, about 5.0; Urea, 2.03; CH_3OH, 12.1; C_2H_5OH, 5.8; *n* C_3H_7OH, 2.28; isopropyl alcohol, 4.7; chloral hydrate, 3.0.

GLUCINIUM See Beryllium.

GLUCOSE (Dextrose) $C_6H_{12}O_2.H_2O$.

SOLUBILITY OF GLUCOSE IN WATER. (Jackson and Silsbee, 1922.)

Saturation was obtained by constant agitation in a thermostat. The saturated solutions were analyzed by a densimetric and polariscopic determination of the dextrose in the sample.

t°.	Gms. $C_6H_{12}O_6$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $C_6H_{12}O_6$ per 100 gms. sat. sol.	Solid Phase.
—0.772.....	6.83	Ice	41.45.....	62.82	$\alpha C_6H_{12}O_6.H_2O$
—2.116.....	16.65	»	45.0.....	65.71	»
—2.305.....	17.59	»	50.0 (tr. pt.)..	70.90	»+$\alpha C_6H_{12}O_6$
—5.605.....	33.02	»	28.0.....	67.0 (unstable)	$\alpha C_6H_{12}O_6$
—5.3 (Eutec.).	31.75	»+$C_6H_{12}O_6.H_2O$	40.0.....	67.6 »	»
+0.5.....	35.2	$\alpha C_6H_{12}O_6.H_2O$	45.0.....	69.69 »	»
15.0.....	44.96	»	55.22.....	73.08 (stable)	»
22.98.....	49.37	»	64.75.....	76.36 »	»
28.07.....	52.99	»	70.2.....	78.23 »	»
30.0.....	54.64	»	80.5.....	81.49 »	»
35.0.....	58.02	»	90.8.....	84.90 »	»
40.4.....	62.13	»			

A recalculation and discussion of the above results is given by Gillis, 1923.

GLUTAMINIC ACID *d* $C_3H_5(NH_2)(COOH)_2$.

Solubility of Glutaminic Acid in Water and in Aqueous Salt Solutions.

Solvent.	t°.	Gms. $C_3H_5(NH_2)(COOH)_2$ per 100 cc. sat. sol.	Authority.
Water	20	0.669	(Pfeiffer and Würgler, 1916.)
»	21	0.658	(Pfeiffer and Angern, 1924.)
Aq. 2.01 *n* Li Cl solution	20	0.707	(Pfeiffer and Würgler, 1916.)
» 2.00 *n* K Cl »	20	0.878	»
» 2.00 *n* KNO_3 »	20	1.205	»

GLUTARIC ACID (Pyrotartaric Acid) $CH_2(CH_2COOH)_2$.

Distribution of Glutaric Acid at 25° Between :
(Smith. 1921–1922.)

Water and Chloroform.			Water and Ether.			Acetone and Glycerol.		
Millimols. per liter.			Millimols. per liter.			Millimols. per liter.		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
17.9	0.375	0.0210	0.70625	0.1875	0.268	0.775	0.875	0.885
24.7	0.570	0.0231	1.300	0.34375	0.264	1.350	1.55	0.870
33.1	0.905	0.0273	3.0875	0.9125	0.296	2.575	2.950	0.874
			6.40	1.875	0.292	2.60	3.025	0.860
			11.90	3.65	0.306	8.15	9.65	0.845

GLYCEROL $CH_2OH.CHOH.CH_2OH$.

Reciprocal Solubility of Glycerol and Water, Determined by the Freezing-Point Method. (Lane, 1925.)

t° of f. pt.	Gms. $C_3H_5(OH)_3$ per 100 gms. sat. sol.	t° of f. pt.	Gms. $C_3H_5(OH)_3$ per 100 gms. sat. sol.	t° of f. pt.	Gms. $C_3H_5(OH)_3$ per 100 gms. sat. sol.
— 0.6	5.0	—23.0	50.0	—45.5	67.1
— 1.6	10.0	—28.2	55.0	—44.5	67.3
— 3.1	15.0	—34.7	60.0	—38.9	70.0
— 4.8	20.0	—41.5	64.0	—29.8	75.0
— 7.0	25.0	—42.5	64.7	—20.3	80.0
— 9.5	30.0	—43.0	65.0	—10.9	85.0
—12.2	35.0	—44.5	65.6	— 1.6	90.0
—15.4	40.0	—44.7	66.0	— 7.7	95.0
—18.8	45.0	—46.5 (Eutec.)	66.7	17.0	100.0

The temperatures given as the freezing-points were those at which crystals appeared and continued to grow. On account of the tendency of glycerol to supercool, seeding was required to obtain true freezing-points of all the more concentrated solutions, beginning at the eutectic point.

Data for this system are also given by Pushin and Glagoleva, 1922, but their results agree with those of Lane only in the region of the higher concentrations of glycerol. They report the eutectic at —31° and 20 mol. per cent (= 57.62 wt. per cent) glycerol, and their other points are evidently incorrect.

Reciprocal Solubility of Glycerol and Pyrocatechol.
(Parvatiker and Mc Ewen, 1924.)

t° of miscibility...	183°.	192°.	192.8°.	192.9.	191°.	172.5°.
Wt. % pyrocatechol....	79.37	63.71	48.68	44.42	35.3	20.05

RECIPROCAL SOLUBILITY OF GLYCEROL AND GUIACOL. (Mc Ewen, 1923.)

This system gives a solubility curve which is a complete circle.

t° of solution No separation between:			Gms. Guaicol per 100 gms. mixture.	t° of solution No separation between:			Gms. Guaicol per 100 gms. mixture.
35°	and	80°	28.57	83.0*	and	39.9	61.35
73.5	»	46.6	31.88	83.0*	»	39.9	61.93
80.1	»	42.2	38.82	79.5	»	42.0	68.02
80.4	»	41.8	39.04	72.9	»	47.0	73.03
82.6	»	40.7*	46.18	67.0	»	51.5	74.72
83.4*	»	39.8*	54.56	66.0	»	52.5	75.22
83.5*	»	39.5	59.87	35.0	»	90.0	77.40

* Indicates critical opalescence.

RECIPROCAL SOLUBILITY OF GLYCEROL AND SALICYLALDEHYDE. (Mc Ewen, 1923.)

t° of solution.	Gms. Salicylaldehyde per 100 gms. mixture.	t° of solution.	Gms. Salicylaldehyde per 100 gms. mixture.
91.5	5.36	176.6	52.22
148.5	18.30	176.5	58.67
165.5	26.54	170.5	77.02
175.5	41.82	143.5	91.38
176.5	48.32	106.5	95.60

RECIPROCAL SOLUBILITY OF GLYCEROL AND : (Parvatiker and Mc Ewen, 1924.)

o Toluidine.			*m* Toluidine.		
t° of miscibility.	Gms. *o* $C_6H_4CH_3.NH_2$ per 100 gms. mixture.	t° of miscibility.	Gms. *m* $C_6H_4CH_3.NH_2$ per 100 gms. mixture.	t° of miscibility.	Gms. *m* $C_6H_4CH_3.NH_2$ per 100 gms. mixture.
100	92.2	89	83.23	33.4	83.62
130	86.14	102	79.23	7.8	66.04
150	73.42	113.5	71.58	7.0	62.86
154	63.28	119.4	64.30	6.7	48.80
154.4	52.53	120.5	58.68	8.2	40.99
154	46.59	120.2	53.10	9.2	31.40
153	40.97	119.5	45.68	14.2	21.68
150	32.04	117.5	36.87	16.8	18.72
137	20.96	88.5	18.71	23.0	13.99
99.2	12.42	upper half of circle		lower half of circle	

GLYCINE (Glycocoll) $CH_2NH_2.COOH$.

100 gms. abs. alcohol dissolve 0.06 gm. glycine at 20°–25° (Pucher and Dehn, 1921.)
100 gms. quinoline » 0.07 » »
100 gms. equi. mol. mixture of alcohol and quinoline dissolve 0.17 gm. glycine at 20°–25°.

Data for the solubility of glycocoll in aqueous and in aqueous-alcohol solutions of different hydrogen ion concentrations are given by Sano, 1926*a*.

GLYCYLGLYCINE $NH\langle^{CO.CH_2NH_2}_{CH_2COOH}$.

Solvent.	t°.	Gms. $C_4H_8O_3N_2$ per 100 cc. sat. sol.	Authority.
Water	18.5	19.09	(von Euler and Rudberg, 1924, 1925.
»	21.0	19.81	(Pfeiffer and Angern, 1924.)
Aq. 0.1*n* NaCl	18.5	19.57	(von Euler and Rudberg, 1924, 1925.)

Solubility of Glycine in Water and in Aqueous Solutions of Salts at 20°.

(Pfeiffer and Würgler, 1916.)

Solutions of the neutral salts of known content were shaken with glycine two days at 20°. This period was sufficient for complete saturation. The glycine present in the saturated solution was determined by the Sörensen titration method. Tests showed that the salts present did not interfere with the accuracy of the method. For the solutions in which large quantities of glycine dissolved, a correction of the concentration of the salt resulting from the expansion of the solution, was applied. This was 0.58 cc. for each gram of glycol in 2 cc. of the sat. solution made with salt solution containing m mols of salt per 10 cc. The correction ormula is $x = m\left(\frac{2 - n \cdot 0.58}{2}\right)$ in which n is the grams of glycol per 2 cc.

Salt used.	Mols. salt per liter of original solution.	Mols. salt per liter of final sol. sat. with glycine.	Gms. Glycine per 100 cc. sat. sol.	Salt used.	Mols. salt per liter of original solution.	Mols. salt per liter of final sol. sat. with glycine.	Gms. Glycine per 100 cc. sat. sol.
Li Cl....	0.96	0.843	20.94	$CaCl_2$.....	0.267	0.234	21.48
Li Br....	0.97	0.851	21.22	»	0.534	0.461	23.48
Na Cl....	1.00	0.881	20.49	»	0.57	0.49	24.24
»	2.00	1.76	20.90	»	1.07	0.90	27.35
»	4.00	3.50	21.28	»	2.14	1.70	35.08
Na Br....	1.00	0.88	20.62	$Ca(NO_3)_2$..	0.5	0.426	25.57
Na I....	0.96	0.844	20.90	$Ba(ClO_4)_2$..	0.412	0.351	25.45
$NaNO_3$..	0.5	0.44	20.75	» ..	0.617	0.520	27.66
» ..	1.0	0.874	21.76	» ..	0.836	0.693	29.49
» ..	2.0	1.73	23.12	$BaCl_2$.....	0.5	0.431	23.75
» ..	4.0	3.42	24.89	$BaBr_2$....	0.5	0.428	24.54
$NaClO_4$..	1.0	0.870	21.74	$Ba(NO_3)_2$..	0.5	0.428	24.85
Na_2SO_4..	0.5	0.439	20.95	$SrCl_2$.....	0.25	0.219	21.36
K Cl....	0.5	0.443	19.78	»	0.5	0.432	23.31
»	1.0	0.886	19.78	»	1.0	0.849	26.05
»	2.0	1.77	19.60	»	2.0	1.62	33.01
»	4.0	3.59	17.81	$SrBr_2$....	0.49	0.421	24.40
$CaBr_2$..	0.5	0.436	24.97	$Sr(NO_3)_2$..	0.5	0.428	24.91

Several determinations in 2.0 normal solutions of Li Br, Na Br and K Br made with 2.0 normal H Cl instead of water gave 34.7 gms. glycine per 100 cc. in each case. A similar determination made with 2.0 n $NaNO_3$ in 2.0 n HCl gave 37.56 gms. glycine.

GLYCOLIC ACID $CH_2OH.COOH$.

Distribution of Glycolic Acid Between Water and Ether.

(Pinnow, 1919.)

Results at 15°.

Concentration of acid in H_2O layer (1).	Concentration of acid in $(C_2H_5)_2O$ layer (2).	$\frac{(1)}{(2)}$.
0.741	0.0235	31.5
0.3695	0.0114	32.4
0.179	0.0055	32.5
0.120	0.00375	32.0
1.258	0.0398	31.6

Results at 25°–8°.

Concentration of acid in H_2O layer (1).	Concentration of acid in $(C_2H_5)_2O$ layer (2).	$\frac{(1)}{(2)}$.
1.0975	0.0307	35.7
0.3442	0.0090	38.2
0.174	0.0048	36 3
0.1125	0.0026	44.1

Diphenylene GLYCOLIC ACID (ms-Oxyfluorene carbonic acid) $C_6H_4C_6H_3C(OH)COOH$.

Solubility in Aqueous Solutions of Hydrochloric Acid at 25°.

(Knox and Richards, 1919.)

Equivalent Normality. HCl.	Equivalent Normality. $C_{14}H_{10}O_3$.	Equivalent Normality. HCl.	Equivalent Normality. $C_{14}H_{10}O_3$.
0.00	0.01082	5.843	0.00343
1.952	0.00492	7.745	0.00352
3.907	0.00355		

GLYCOL (Ethylene Glycol) $CH_2OH.CH_2OH$.

100 cc. sat. solution of glycol in Water contain 19.64 gm. $CH_2OH.CH_2OH$ at 21°.
» » » » 0.02 *n* CH_3COOK » 17.20 » » » »

(Pfeiffer and Angern, 1924.)

GLYCOL DINITRATE $CH_2ONO_2.CH_2ONO_2$.

One liter of water dissolves 6.2 gms. $CH_2ONO_2.CH_2ONO_2$ at 15°, 6.8 gms. at 20° and 9.2 gms. at 50°. (Rinkenbach, 1926, quoted from Naoum, 1924.)

Ethylene, Propylene, etc. GLYCOL ESTERS.

Solubility of Stearic, and Palmitic Esters of Ethylene, Propylene and Trimethylene Glycol in Absolute Alcohol at 0° and 15°.

(Howe, 1918.)

Saturated solutions were prepared at a temperature slightly above 15° and these were kept for 16 hours in a thermostat at 15°. About 10 cc. of the clear supernatant solution were withdrawn, weighed accurately and the alcohol evaporated and the residue dried at 95° and weighed. The remainder of the saturated solution was placed in a mixture of melting ice and kept at 0° in a refrigerator for several hours. The supernatant solution was again analyzed as before.

Compound.	Formula.	M. pt.	Gms cmpd. per 100 gms. C_2H_5OH at 0°.	Gms cmpd. per 100 gms. C_2H_5OH at 15°.
Mono Stearic Ester of Ethylene Glycol.	$CH_2OH.CH_2(C_{18}H_{35}O_2)$	58.5	0.67	2.0
Di » » »	$CH_2(C_{18}H_{35}O_2).CH_2(C_{18}H_{35}O_2)$	75.0	0.01	0.02
Mono Palmitic » » »	$CH_2OH.CH_2(C_{16}H_{31}O_2)$	51.5	1.62	10.0
Di » » » »	$CH_2(C_{16}H_{31}O_2)CH_2(C_{16}H_{31}O_2)$	68.7	0.018	0.055
Mono Stearic » Propylene »	$1.2CH_3CHOHCH_2(C_{18}H_{35}O_2)$	59.5	0.021	0.034
Di » » » »	» $CH_3CH(C_{18}H_{35}O_2)CH_2(C_{18}H_{35}O_2)$	72.3	0.0012	0.0063
Mono Palmitic » » »	» $CH_3CHOH.CH_2(C_{16}H_{31}O_2)$	54.2	0.0193	0.0907
Di » » » »	» $CH_3CH(C_{16}H_{31}O_2)CH_2(C_{16}H_{31}O_2)$	68.8	0.0516	0.0115
Mono stearic » Trimethylene »	$1.3CH_2OHCH_2CH_2(C_{18}H_{35}O_2)$	60.5	0.01431	0.0305
Di » » » »	» $CH_2(C_{18}H_{35}O_2)CH_2.CH_2(C_{18}H_{35}O_2)$	64.7	0.00126	0.00381
Di Palmitic » » »	» $CH_2(C_{16}H_{31}O_2)CH_2.CH_2(C_{16}H_{31}O_2)$	56.2	0.0244	0.0517

GLYOXIME $CH(:NOH).CH(:NOH)$.

Freezing-point data are given by Semeria and Bocca, 1926, for the following systems: glyoxime + xanthone, methyl glyoxime + xanthone, dimethyl glyoxime + xanthone and methyl ethyl glyoxime + xanthone.

GNOSCOPINE PICRATE (m. pt. 185°.5).

100 gm sat. sol of gnoscopine picrate in water contain 0.009 gm of the cmpd. at 15°.
» » » » » » alcohol » 0.04 » » »
» » » » » » acetone » 2.34 » » »

(Maplethorpe and Evers, 1925.)

GOLD Au.

Solubility of Gold in Aqueous Solutions of Potassium Cyanide.

(White, 1919.)

Rectangular pieces of gold, $1^1/_2 \times 1$ cm., were suspended by cotton thread in jars containing 500 cc. of solution. The milligrams of gold dissolved per sq. cm. in 24 hours or less was determined by loss in weight. Air was bubbled through the solutions in some cases. It was concluded that the speed of the reaction depends entirely upon the rate of diffusion of the cyanide and the necessary oxygen, of which in practise the latter is the more important. The final effect of the reaction is represented by the well known equation $2\,Au + 4\,KCN + O + H_2O = 2\,K\,Au(CN)_2 + 2\,KOH$. Therefore, 0.010 gm. of oxygen per liter is equivalent to 0.0163 per cent of KCN, 0.007 gm. is equivalent to 0.0114 per cent KCN and 0.006 gm. per liter, to 0.0098 per cent KCN. With water having an average content of 0.006 gm. oxygen per liter the concentration of KCN should not exceed 0.01 per cent.

Solubility of Gold Amalgam in Aqueous Solutions of Potassium Cyanide. (White, 1923.)

Comparative experiments with two pieces of pure gold, one of which was coated with a very small amount of mercury, suspended in a cyanide solution containing 0.027 per cent KCN and 0.006 per cent Na OH and saturated with oxygen, showed that 1.3 mg. Au per sq. cm. of the pure gold was dissolved in 24 hours at 28°, but that only 0.5 mg. Au per sq. cm. of the amalgam coated gold was dissolved under the same conditions.

Data for the distribution of gold between bismuth and zinc, bismuth and aluminium, lead and zinc, lead and aluminium, and zinc and tellurium, are given by Tammann and Schaftmeister, 1924.

GOLD HYDROXIDE (Auric) $Au(OH)_3$.

The solubility of auric hydroxide in water, as calculated from satisfactorily agreeing values for the solubility product, assuming complete dissociation, is 2.4×10^{-12} mols. $Au(OH)_3$ per liter. (Jirsa and Jelinek, 1924.)

Solubility of Auric Hydroxide in Aqueous Solutions of Sulfuric Acid at 11°. (Jirsa and Buryanek, 1923; Jirsa and Jelinek, 1924.)

Gold hydroxide, $Au(OH)_3$, prepared by anodic oxidation of gold was agitated in a thermostat at 11° with aqueous H_2SO_4 solutions for different lengths of time. The curves show an increase with time. The freshly made hydroxide dissolves more rapidly than older hydroxide. It is not certain that equilibrium was reached. In the later experiments an attempt was made to approach equilibrium from above, that is, to go from concentrated solutions, by hydrolysis, to dilute solutions. It appears that a tendency exists to form super saturated solutions in the beginning, but in about 48 hours a concentration is reached which agrees fairly well with that found previously by constant agitation for 60 days. The results for diluted 35 normal H_2SO_4 solutions rotated 60 days with the original solid phase and with new, were:

Normality of H_2SO_4.	11.72.	12.56.	19.33.
Gms. Au per 100 cc. solution....	0.0922	0.1324	1.4128

GOLD Ammonium **NITRATE** $Au(NH_3)_4(NO_3)_3$.

Solvent.	t°.	Gms. $Au(NH_3)_4(NO_3)_3$ per 100 gms. sat. sol.	Authority.
Water.....	25	2.88	(Weitz, 1914.)
Aq. 0.1*n* KNO_3.....	»	2.156	»

GUAICOL $C_6H_4(OH)OCH_3$, *o*.

Freezing-point data are given by Puschin and Vaic, 1927, for mixtures of guaicol and each of the following compounds: naphthalene, β naphthylamine, pyridine, *o* and *p* toluidine and ethyl urethan.

Nitro **GUANIDINE** $NH_2.C(NH).NH.NO_2$.

Solubility in Aqueous Solutions of Sulfuric Acid.

Results at 0° and at 25°. (Davis, 1922.)

Per cent conc. of aq. H_2SO_4.	Gms. $NH_2.C(NH)NH.NO_2$ per 100 cc. sat. sol. at. 0°.	at. 25°.
0 (= H_2O).....	0.12	0.42
15.....	0.30	0.55
20.....	0.45	1.05
25.....	0.75	1.8
30.....	1.3	2.9
35.....	2.0	5.2
40.....	3.4	8.0
45.....	5.8	10.9

Results at 13°. (Ewan and Young, 1921.)

Per cent conc. of aq. H_2SO_4.	Gms. $NH_2.C(NH)NHNO_2$ per 100 gms. aq. H_2SO_4.
5.8.....	0.37
17.2.....	0.65
20.0.....	0.72
22.7.....	0.87
25.2.....	0.95
28.2.....	1.37
33.2.....	2.55

In the case of the determinations by Davis an excess of solid was shaken with the aqueous acid and the saturated solution analyzed. The determinations by Ewan and Young were made by adding 82 % H_2SO_4 to definite mixtures of nitro guanidine and water untill the solid just dissolved. These authors also give a few determinations made with aqueous nitric acid mixtures.

GUANIDINE PICRATE $HN : C(NH_2)_2.OHC_6H_2(NO_2)_3$.

100 gms. sat. solution in water contain 0.035 gm. picrate at 7°.5, 0.061 gm. at 21°, 0.09 gm. at 32°.5, 0.167 gm. at 48°, 0.502 gm. at 78° and 0.864 gm. at 92°.

100 gms. sat. solution in aq. 50 % ethyl alcohol contain 0.12 gm. at 8°, 0.191 gm. at 19°, 0.397 gm. at 37°, 0.883 gm. at 57° and 1.662 gm. at 74°. (Medes 1925, 1926.)

100 cc. H_2O dissolve 0.132 gm. **methyl guanidine picrate** at 10° and 0.178 gm. at 20°.
» 0.117 » **dimethyl guanidine picrate** » 0.162 »
» 0.697 » **ammonium picrate** » 1.03 »
(Greenwald, 1926.

HAFNIUM Oxy CHLORIDE $HfOCl_2$.

Solubility of Hafnium Oxychloride in Aqueous Solutions of Hydrochloric Acid at 20°. (von Hevesy, 1925.)

The hafnium contained 5 per cent ZrO_2.

Normality aq. HCl.	d of sat. sol.	Gm. mols. $HfOCl_2$ per liter sat. sol.	Normality aq. HCl.	d of sat. sol.	Gm. mols. $HfOCl_2$ per liter sat. sol.
5.64	–	0.167	10.56	1.180	0.0801
6.48	1.127	0.103	11.28	–	0.1509
9.02	1.154	0.053	11.40	–	0.0619
10.33	–	0.0668			

HAFNIUM Ammonium FLUORIDES, $Hf(NH_4)_2F_6$ and $Hf(NH_4)_3F_7$.

Solubility in Water and Aq. NH_4F Solutionr.
(von Hevesy, 1925; von Hevesy, Christiansen and Berglund, 1925.)

Compound.	Solvent.	t°.	Mols. per liter NH_3.	Mols. per liter Hf.
$Hf(NH_4)_2F_6$	Water	0	1.807	0.890
»	»	20	2.832	1.425
$Hf(NH_4)_3F_7$	»	0	1.230	0.425
»	»	20	1.756	0.538
»	0.922 n NH_4F.....	20	–	0.261
»	1.971 »	20	–	0.108
»	5.01 »	20	–	0.0258
» + $Hf(NH_4)_2F_6$	Water	20	3.038	1.439

HAFNIUM Potassium FLUORIDE HfK_2F_6.

One liter of aq. 0.125 n HF solution dissolves 0.1008 mols. HfK_2F_6 at 20°.
» 5.89 » 0.1942 »
(von Hevesy, 1925; von Hevesy, Christiansen and Berglund, 1925.)

HAFNIUM PHOSPHATE $HfO(H_2PO_4)$.

Solubility of Hafnium Phosphate in Aqueous Solutions of Hydrochloric Acid at 20°. (von Hevesy and Kimura, 1925.)

About 0.1 gm. of the compound was shaken 3 days in a thermostat and then allowed to stand many days. 100 cc. of the solution filtered through glass wool was evaporated and residue ignited and the weighed.

Normality of aq. HCl.	Wt. of ignited residue from 100 cc. sat. sol.	Gm. mols. compd. per liter.
5.94	0.0031	0.00009
10.21	0.0043	0.00012
10.48	0.0046	0.00013

HELIUM He.

Solubility of Helium in Water. (von Antropoff, 1925.)

New determinations made with a highly refined apparatus and with the greatest possible accuracy, gave the following values, which are expressed in terms of the Bunsen absorption coefficient, as modified by Kuenen to show the volume of gas (reduced to 0° and the 760 mm) dissolved by 1.0 gm. of H_2O..

t°.....	0°.	10°.	20°.	30°.	40°.	50°.
Absorption coef.....	0.0097	0.0099	0.0100	0.0101	0.0103	0.0108

SOLUBILITY OF HELIUM IN WATER. (Cady, Elsey and Berger, 1922.)

The following very carefully determined results are given in terms of the Ostwald solubility expression $\alpha = \frac{273.1 \times V_1}{T \times V}$, in which V = the volume of H_2O, V_1 = the volume of helium absorbed by V volumes of H_2O and T = temp. on the absolute scale.

t°.....	2°.0.	10°.	25°.	30°.
α.....	0.00937	0.00895	0.00860	0.00817

According to Venable and Fuwa, 1923, 100 cc. of H_2O dissolve 1.4 cc. He (reduced to 0° and 760 mm.) at 21°. These authors also found that 100 cc. of rubber dissolve about 1.0 cc. of helium at 21°, as determined by pumping out the gas with a Töpler pump and measuring it over mercury.

HELIANTHINE PHENOLATE $C_{14}H_{13}N_3SO_3.C_6H_5OH$.

1000 cc. H_2O dissolve 0.157 gm. helianthine phenolate at 20-25°. (Stark and Dehn, 1918.

HEMOGLOBIN

100 gms. absolute alcohol dissolve 0.37 gm. hemoglobin at 20-25°. } (Pucher and
" quinoline " 0.23 " " " " } Dehn, 1921.)

100 gms. equimol. mixture of alcohol and quinoline dissolve 0.59 gm. hemoglobin at 20-25°.

HEPTANE $n\ CH_3(CH_2)_5CH_3$.

100 gm. sat. solution of heptane in water contain about 0.005 gm. $CH_3(CH_2)_5CH_3$ at 15°.5. (Fühner, 1924.)

100 gm. sat. solution of heptane in 92 wt. % alcohol contain 26.4 to 28.5 gms. $CH_3(CH_2)_5CH_3$ at 15°. (Ormandy and Craven, 1921.)

HEPTYL ALCOHOL $n\ CH_3(CH_2)_5CH_2OH$.

SOLUBILITY OF *n* HEPTYL ALCOHOL IN WATER. (Fühner, 1924.)

The determinations were made by the synthetic method and from the curve obtained, the following results were read.

°.....	70°.	80°.	90°.	100°.	110°.	120°.	130°.
Gms. $CH_3(CH_2)_5CH_2OH$ per 100 gm. sat. sol...	0.125	0.170	0.225	0.285	0.355	0.43	0.515

An approximate determination at 18° gave 0.10 gm. per 100 gm. sat. sol.

HEPTYL AMINE $n\ CH_3(CH_2)_5CH_2NH_2$.

DISTRIBUTION OF HEPTYL AMINE AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Ether. Millimols. per liter.			Water and Xylene. Millimols. per liter.		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.120	1.41	11.75	0.083	0.917	11.0
0.200	3.105	15.5	0.152	1.848	12.3
0.275	5.145	18.7	0.270	3.730	13.8
0.385	8.00	20.8	0.438	9.562	21.8
			0.445	9.565	21.5

HEXAMETHYLENE TETRAMINE $(CH_2)_6N_4$.

SOLUBILITY OF HEXAMETHYLENE TETRAMINE IN SEVERAL SOLVENTS AT ORDINARY TEMPERATURE. (Utz, 1919.)

Solvent.	Gms. $(CH_2)_6N_4$ per 100 gms. solvent.	Solvent.	Gms. $(CH_2)_6N_4$ per 100 gms. solvent.
Water.....	167.0	Carbon tetrachloride.....	0.85
Ethyl ether.....	0.06	Amyl alcohol.....	1.84
Trichlor ethylene.....	0.11	Absolute alcohol.....	2.89
Xylene.....	0.14	90 % alcohol	5.58
Carbon disulfide.....	0.17	Methyl alcohol.....	7.25
Benzene.....	0.23	Chloroform	13.40
Tetrachlor ethane	0.50	86.5% glycerol (d=1.2326).	26.50*
Acetone	0.65	98.5% " (d=1.2645).	20.9*

* Holm, 1921, 1922.

100 gms. glycol diacetate dissolve about 0.9 gm. HEXA METHYLENE TRIPEROXIDE DIAMINE at 25°. (Taylor and Rinkenbach, 1926.)

HEXANE $n\,CH_3(CH_2)_4CH_3$.

100 gms. sat. solution of hexane in water contain about 0.014 gm. C_6H_{14} at 15°.5. (Fühner, 1922.)

100 gms. sat. solution of hexane in 92 wt. % alcohol contain 46.4 gm. C_6H_{14} at 15°. (Ormandy and Craven, 1921.)

The critical solution temperature of hexane + methyl alcohol is at 42° and the mixture contains 80 per cent hexane. A mixture of equal weights of hexane and methyl alcohol has a mutual miscibility temperature of 35°.5. The effect of increasing amounts of water and of salts upon this temperature was studied. (Howard and Patterson; 1926.)

THE MUTUAL SOLUBILITY OF HEXANE AND SULFUR DIOXIDE. (Seyer and Gill, 1924.)

Highly purified products were used. The mixtures were sealed in bulbs and the temperatures of appearance and disappearance of turbidity carefully determined.

t°.	Wt. per cent C_6H_{14} in mixture.	t°.	Wt. per cent C_6H_{14} in mixture.	t°.	Wt. per cent C_6H_{14} in mixture.
—93.7.....	100.0	+3.0.....	69.3	8.6.....	7.3
—96 (Eutectic).	—	7.0.....	61.5	7.0.....	5.3
—31.....	88.8	7.1.....	57.3	—20.3.....	3.3
—30.....	88.4	10.0.....	41.0	—61.5.....	1.0
—28.1.....	88.0	10.1.....	32.4	—73.5(Eutectic)	—
—19.0.....	84.1	9.9.....	18.5	—72.8.....	0.0
— 3.3.....	75.5	9.0.....	11.75		

Freezing-point data for mixtures of hexane and *m* nitro toluene, and for hexane and *m* toluidine are given by Dessart, 1926. This author also gives the demixing curve for the latter pair of compounds.

The critical solution temperature for the system hexane + *o* toluidine is at 21°.5 and 54.5 per cent C_6H_{14} in the mixture. The freezing-point curve for this system is also given by Hartenberg, 1926.

HEXOIC ACID See Caproic Acid, p. 1152.

HEXYL ALCOHOL $n\,CH_3(CH_2)_4CH_2OH$.

SOLUBILITY OF *n* HEXYL ALCOHOL IN WATER. (Fühner, 1924.)

The determinations were made by the synthetic method, and from the curve obtained the following results were read.

t°.	Gms. $C_6H_{14}O$ per 100 gms. sat. sol.	t°.	Gms. $C_6H_{14}O$ per 100 gms. sat. sol.	t°.	Gms. $C_6H_{14}O$ per 100 gms. sat. sol.
0.....	0.78	40.....	0.52	80.....	0.62
10.....	0.67	50.....	0.515	90.....	0.68
20.....	0.59	60.....	0.53	100.....	0.785
30.....	0.545	70.....	0.565	110.....	0.89

HEXYL AMINE $n\,CH_3(CH_2)_4CH_2NH_2$.

DISTRIBUTION OF *n* HEXYL AMINE BETWEEN WATER AND XYLENE AT 25°. (Smith, 1921, 1922.)

Millimols. per liter			Millimols. per liter		
H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.225	0.5875	2.61	0.7775	3.225	4.17
0.425	1.3375	3.14	1.50	8.50	5.65
0.625	2.325	3.88	2.80	17.2	6.15

HIPPURIC ACID $C_6H_5CO.NHCH_2COOH$.

One liter	water	dissolves	3.754 gms. $C_9H_9O_3N$ at 25° (Larsson, 1926.)		
»	0.025 *n* Na fumarate	»	7.615	»	»
»	0.05 *n* »	»	10.38	»	»
»	0.025 *n* Na tartrate	»	7.418	»	»
»	0.05 *n* »	»	9.712	»	»

100 gms. absolute alcohol dissolve 4.6 gms. $C_9H_9O_3N$ at 20°-25° (Pucher and Dehn, 1921.
» quinoline » 20.41 » »
» equi mol. mixture of alcohol and quinoline dissolve 23.10 gms. $C_9H_9O_3N$ at 20°-25°.

DISTRIBUTION OF HIPPURIC ACID AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Ether.			Acetone and Glycerol.		
Millimols. $C_9H_9O_3N$ per liter of			Millimols. $C_9H_9O_3N$ per liter of		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	Acetone layer A.	Glycerol layer G.	$\frac{A}{G}$
0.855	0.355	0.415	2.75	2.40	1.15
1.42	0.56	0.394	4.80	4.10	1.17
2.58	0.98	0.380	9.70	8.20	1.18
4.66	1.70	0.364	22.80	19.85	1.15
8.04	2.80	0.348			

HYDRASTINE $C_{21}H_{21}NO_6$.

SOLUBILITY OF HYDRASTINE IN WATER AT 15°. (Kolthoff, 1925.)

From colorimetric p_H determinations made in mixtures composed of 0.01 *n* hydrastine hydrochloride and 0.01 *n* NaOH solutions the dissociation constant was calculated to be $K = 1.7.10^{-8}$. It was found that 5 cc. of hydrastine HCl + 1.0 cc. of 0.01 *n* NaOH gave a trace of crystalline deposit after one day. The sat. sol. had $p_H = 5.7$ and $p_{OH} = 8.5$. From this and other determinations it was concluded that solid hydrastine was in equilibrium with a solution which was 7.10^{-3} normal with respect to hydrastine salt and had a hydroxyl ion concentration of 2.10^{-9}. Therefore, the solubility product $L_{hydrastine} = 1.4.10^{-11}$ and from this and K the solubility of hydrastine in water was calculated to be $8.2.10^{-4}$ mols. per liter at 15°.

HYDRAZINE SULFATES $(N_2H_5)_2SO_4$ (I). $N_2H_6SO_4$ (II).

SOLUBILITY OF THE TWO HYDRAZINE SULFATES IN WATER. (Sommer and Weise, 1916.)

Results for $(N_2H_5)_2SO_4$.				Results for $N_2H_6SO_4$.			
t°.	Gms. $(N_2H_5)_2SO_4$ per 100 gms. sat. sol.	Mols. $(N_2H_5)_2SO_4$ per liter.	Solid Phase.	t°.	Gms. $N_2H_6SO_4$ per 100 gms. sat. sol.	Mols. $N_2H_6SO_4$ per liter.	Solid Phase.
25...	66.91	12.48	$(N_2H_5)_2SO_4.H_2O$	20...	2.794	0.220	$N_2H_6SO_4$
35...	71.28	15.32	»	25...	3.302	0.260	»
45...	78.54	22.59	»	30...	3.746	0.299	»
50...	82.33	28.76	»+$(N_2H_5)_2SO_4$	40...	3.987	0.404	»
55...	83.40	31.01	$(N_2H_5)_2SO_4$	50...	6.538	0.538	»
60...	84.72	34.22	»	60...	8.322	0.698	»
				70...	10.465	0.902	»
				80...	12.580	1.107	»

SOLUBILITY OF BIVALENT HYDRAZINE SULFATE (II) IN AQUEOUS SOLUTIONS OF ACIDS AT 25°. (Sommer and Weise, 1916.)

In aq. H_2SO_4		In aq. HCl.		In aq. CH_3COOH	
Gms. H_2SO_4 per liter.	Gms. $N_2H_6SO_4$ per 100 gms. sat. sol.	Gms. HCl per liter.	Gms. $N_2H_6SO_4$ per 100 gms. sat. sol.	Gms. CH_3COOH per liter.	Gms. $N_2H_6SO_4$ per 100 gms. sat. sol.
0.4897	3.143	0.00	3.302	0.5157	3.198
4.887	2.680	0.3645	3.156	6.8963	3.147
26.59	1.541	3.645	2.876	33.306	2.903
49.00	1.026	18.25	2.652	63.00	2.737
116.18	0.518	36.45	2.639	117.38	2.323
144.18	0.4318	66.08	2.615		

HYDROBENZAMIDE ($C_6H_5CH)_3N_2$.

100 gms. absolute alcohol dissolve 1.99 gms. $(C_6H_5CH)_3N_2$ at 20–25° (Pucher and Dehn, 1921.)
» quinoline » 3.94 » » » »
» equimol mixture of alcohol and quinoline dissolve 2.56 gms. $(C_6H_5CH)_3N_2$ at 20–25°

HYDROBROMIC, HYDROCHLORIC and HYDRIODIC ACIDS HBr, HCl and HI.

Freezing-Points of Dilute Aqueous Solutions of Each of the Three Acids.
(Klein and Svanberg, 1920.)

H_2O + Hydrobromic Acid.		H_2O + Hydrochloric Acid.		H_2O + Hydriodic Acid.	
t° of f. pt.	Normality of aq. HBr.	t° of f. pt.	Normality of aq. HCl.	t° of f. pt.	Normality of aq. HI.
—0.362	0.1	—0.34	0.1	—0.35	0.1
—0.923	0.25	—0.876	0.25	—0.91	0.25
—1.907	0.5	—1.807	0.5	—1.90	0.50

Freezing-point data for mixtures of HBr and toluene and for HBr and mesitylene are given by Maass and Russell, 1918. Results for HBr + *o*, *m* and *p* xylene are given by Maass, Boomer and Morrison, 1923.

A compilation of the available data upon the partial vapor pressure of aqueous hydrochloric acid solutions is given by Zeisberg, 1925.

HYDROCARBONS.

In connection with the use of liquid sulfur dioxide for the fractionation of mixtures of hydrocarbons, many determinations have been made of the solubility of aromatics, paraffines, olefins and naphthenes in this solvent. A general review of the subject and many new experiments are given by Moore, Morrell and Egloff, 1918. The methods are, however, more in the nature of fractional extraction processes than equilibria studies. Mixtures of various proportions of liquid sulfur dioxide and oil were shaken together, usually at — 18° or — 10°, and, after separation of the two layers, each was freed of SO_2 and its density and refractive index determined. It was found in general that the paraffines (pentane, hexane, octane, nonane and decane) are completely insoluble and the aromatics and olefins (benzene, toluene, xylene, mesitylene, hexylene, and caprylene) completely soluble in liquid sulfur dioxide. Naphthalene and cyclohexane varied in solubility depending upon the ratio of SO_2 used. Data for a great variety of synthetic mixtures of hydrocarbons are given and it was found that within certain limiting concentrations : (a) Aromatics may be separated from paraffins or naphthenes, (b) Olefins may be separated from paraffins or naphthenes, (c) Aromatics and olefins together may be separated from paraffins or naphthenes, (d) Naphthenes may be separated from paraffins. The particular advantage of the method is that the separated unsaturated and aromatic oils may be recovered and their identity proven by further physical tests.

HYDROGEN H_2.

Solubility of Hydrogen in Water.
(Milligan, 1924.)

Hydrogen mixed with air was shaken for 2 minutes with distilled water previously saturated with air. The gas phase was analyzed by means of a Haldane gas analysis apparatus before and after contact with the water and the amount of hydrogen dissolved was estimated by difference. It was found that 1 cc. of H_2O at 25° dissolves 0.017 cc. hydrogen (reduced to 0°) when the pressure of the gas over the water is 760 mm.

Solubility of Hydrogen in Water and in Rubber.

(Venable and Fuwa, 1922.)

The gas dissolved by a given amount of air free rubber was pumped out with a Töpler pump and measured over mercury.

100 cc. H_2O dissolve 1.8 cc. hydrogen (reduced to 0° and 760^{mm}) at 21°.
» Rubber » less than 1.0 cc. (» ») » .

Ratio of the Solubility of Hydrogen in Water to its Solubility in Aqueous Solutions of Sucrose at 15°.

(Garner and Masson, 1921.)

Mols. sucrose per liter.....	0.292	0.585	0.877	1.169	1.460	1.755
Ratio, H_2 in H_2O ÷ H_2 in aq. sucrose.	1.11	1.23	1.39	1.61	1.87	2.17

Solubility of a Mixture of 3 volumes of Hydrogen + 1 volume of Nitrogen in Liquid Ammonia. (Larson and Black, 1925.)

Total Pressure.	t°.	Cc. Gas (at standard temp-and pressure) dissolved by 1.0 gm. liquid Ammonia		
		H_2.	N_2.	Total.
50 atmospheres.....	—25.2	1.62	0.73	2.35
»	—18.5	1.90	0.84	2.74
»	—10.0	2.07	0.94	3.01
»	— 3.0	2.35	1.08	3.43
»	0.0	2.61	1.15	3.76
»	2.5	2.70	1.19	3.89
»	19.0	3.19	1.46	4.65
100 atmospheres.....	—25.0	3.30	1.35	4.65
»	—20.0	3.66	1.46	5.12
»	—16.5	3.85	1.63	5.48
»	—10.0	4.43	1.83	6.26
»	— 5.2	4.84	2.02	6.86
»	0.0	5.28	2.28	7.56
»	+22.0	7.54	3.21	10.75
150 atmospheres.....	—22.0	4.70	1.89	6.59
»	—17.2	5.12	2.09	7.21
»	— 9.2	6.20	2.44	8.64
»	— 7.2	6.30	2.58	8.88
»	+ 5.0	8.22	3.33	11.55
»	13.3	9.42	3.61	13.03

HYDROGEN PEROXIDE H_2O_2.

Freezing-Points of Mixtures of Hydrogen Peroxide and Water.

(Maass and Herzberg, 1920.)

t° of f. pt.	Gms H_2O_2 per 100 gms. mixture.	Solid Phase.	t° of f. pt.	Gms H_2O_2 per 100 gms. mixture.	Solid Phase.
— 2.0 ...	100	H_2O_2	—51.7	49.8	$H_2O_2.2H_2O$
—14.0 ...	86.0	»	—50.8	47.0	»
—22.7 ...	80.45	»	—51.8	46.21	»
— 36.5 ...	74.0	»	—46.25 ...	42.02	H_2O
—39.5 ...	69.2	»	—38.0	37.80	»
—45.5 ...	65.4	»	—35.7	36.47	»
—50.0 ...	63.05	»	—28.5	31.96	»
—52.5 ...	61.14	»	—23.4	27.72	»
—54.5 ...	58.8	$H_2O_2.2H_2O$	—17.0	22.50	»
—54.3 ...	56.2	»	—11.1	15.91	»
—53.6 ...	55.06	»	— 6.3	9.96	»
—52.5 ...	53.7	»	— 3.4	4.9	»

DISTRIBUTION OF HYDROGEN PEROXIDE BETWEEN WATER AND AMYL ALCOHOL AT 0°. (Menzel, 1923.)

Cc. 0.05 n Thiosulfate solution required for 10 cc. of Aq. layer (W.)	Cc. 0.05 n Thiosulfate solution required for 10 cc. of Alcoholic layer (A)	$\frac{W}{A}$.
32.05	4.60	6.97
36.50	5.27	6.96
43.83	6.36	6.89
46.50	6.70	6.94
52.85	7.73	6.85

Cc. 0.05 n Thiosulfate solution required for 10 cc. of Aq. layer (W).	Cc. 0.05 n Thiosulfate solution required for 10 cc. of Alcoholic layer (A)	$\frac{W}{A}$.
52.95	7.70	6.88
59.15	8.60	6.88
68.00	10.05	6.80
76.25	11.23	6.79

Data are also given for the distribution of hydrogen peroxide between aqueous solutions of potassium metaborate and tetraborate, and amyl alcohol at 0°.

DISTRIBUTION OF HYDROGEN PEROXIDE BETWEEN WATER AND ETHYL ETHER AT 18°. (de Kolossovsky, 1919, 1925.)

The mixtures of equal volumes of water and ether, to which different amounts of redistilled « Perhydrol » were added, were vigorously shaken during 20 minutes, by periods of 2 minutes each, and allowed to stand in the thermostat between the agitations and for 1 hour after the last. Aliquot portions of each layer were titrated with aqueous $KMnO_4$ solution in presence of sulfuric acid. The determinations were plotted and the following results were obtained from the curve.

Gms. H_2O_2 per 100 cc. H_2O layer (p).	Gms. H_2O_2 per 100 cc. $(C_2H_5)_2O$ layer (p_1).	$\frac{p}{p_1}$.
0.935	0.065	14.4
2.795	0.205	13.6
4.640	0.360	12.9
6.470	0.530	12.2
9.182	0.818	11.2
10.968	1.034	10.6
12.734	1.266	10.1
14.479	1.521	9.5
16.204	1.796	9.0

Gms. H_2O_2 per 100 cc. H_2O layer (p).	Gms. H_2O_2 per 100 cc. $(C_2H_5)_2O$ layer (p_1).	$\frac{p}{p_1}$.
17.908	2.092	8.6
19.590	2.410	8.1
21.251	2.749	7.7
23.707	3.293	7.2
25.324	3.676	6.9
26.929	4.071	6.6
28.522	4.478	6.4
30.119	4.881	6.2
31.714	5.286	6.0

HYDROGEN SELENIDE H_2Se.

SOLUBILITY OF HYDROGEN SELENIDE IN WATER AND IN AQUEOUS SOLUTIONS OF HYDRIODIC ACID AT A PARTIAL PRESSURE OF H_2Se OF 760 MM. (Mc Amis and Felsing, 1925.)

	Solubility in Water.		Solubility in Aq. HI Solut. at 25°.		
t°.	Mols. H_2Se per liter sat. sol.	Cc. H_2Se (at 0° and 760 mm.) per liter sat. sol.	Mols. HI per liter.	Mols. H_2Se per liter sat. sol.	Cc. H_2Se (at 0° and 760 mm. per liter sat. sol.
14.6....	0.09789	2194	0.20	0.08478	1900
15.0....	0.09611	2154	0.40	0.08634	1935
25.0....	0.08415	1886	2.73	0.11012	2468
25.6....	0.08277	1855			
35.0....	0.07317	1640			

HYDROGEN SULFIDE H_2S.

SOLUBILITY OF HYDROGEN SULFIDE IN WATER AND IN RUBBER. (Venable and Fuwa, 1922.)

The gas dissolved by a given amount of air free rubber was pumped out with a Töpler pump and measured over mercury.

100 cc. H_2O dissolve 243 cc. (at 0° and 760 mm) H_2S at 21°
» Rubber » 273 cc. (») »

SOLUBILITY OF HYDROGEN SULFIDE IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°. (Kendall and Anderson, 1921.)

Normality of aq. HCl solutions.	Gm. mols. H_2S per liter sat. sol.	Cc. H_2S (at 0° and 760 mm.) dissolved by 1 cc. sat. sol. (at 760 mm. pressure).	Normality of aq. HCl solutions.	Gm. mols. H_2S per liter sat. sol.	Cc. H_2S (at 0° and 760 mm.) dissolved by 1 cc. sat. sol. (at 760 mm. pressure).
0.0 (= H_2O).	0.1023	2.266	2.498.....	0.1030	2.281
0.1348.....	0.1018	2.253	3.040.....	0.1034	2.291
0.2828.....	0.1015	2.247	3.308.....	0.1039	2.301
0.6308.....	0.1016	2.250	4.410.....	0.1076	2.384
1.180.....	0.1020	2.260	4.874.....	0.1090	2.413
1.848.....	0.1026	2.272			

HYDROQUINOL (Hydroquinone) *p* $C_6H_4(OH)_2$.

SOLUBILITY OF HYDROQUINOL IN WATER AND IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°.

(Granger and Nelson, 1921; Knox and Richards, 1919.)

Normality of aq. HCl.	Gm. mol. $C_6H_4(OH)_2$ per liter sat. sol.		Normality of aq. HCl.	Gm. mol. $C_6H_4(OH)_2$ per liter sat. sol.	
0.0 (= H_2O)...	0.666	(K. and R.)	3.793.....	0.282	(K. and R.)
0.0 » ...	0.645	(G and N.)	5.728.....	0.215	»
0.01.....	0.645	»	7.597.....	0.188	»
0.10.....	0.633	»	9.237.....	0.178	»
1.0.....	0.494	»	10.97.....	0.166	»
1.892.....	0.402	(K. and R.)			

SOLUBILITY OF HYDROQUINOL IN AQUEOUS SOLUTIONS OF SALTS AT 18°.

(Linderstrom-Lang, 1924.)

Due to the instability of hydroquinol at low hydrogen ion concentrations all the determinations were made in presence of 0.01 *n* hydrochloric acid. Hence in each case the solvent is composed of 0.01 *n* HCl containing the stated gram equivalents per liter (normality *n*) of the several salts.

Aq. solvents 0.01 *n* HCl + :	Gm. mols. $C_6H_4(OH)_2$ per liter sat. sol.	Aq. solvents 0.01 *n* HCl + :	Gm. mols. $C_6H_4(OH)_2$ per liter sat. sol.	Aq. solvents 0.01 *n* HCl + :	Gm. mols. $C_6H_4(OH)_2$ per liter sat. sol.
0.0.....	0.5103	0.6 *n* KBr.....	0.4394	0.4 *n* $SrCl_2$....	0.4444
0.835 *n* LiCl..	0.3747	1.2 »	0.3787	0.8 »	0.3894
2.087 » ..	0.2362	1.8 »	0.3281	1.6 »	0.2948
3.340 » ..	0.1493	0.6 *n* KI.....	0.4427	3.2 »	0.1636
4.175 » ..	0.1117	1.2 »	0.3923	0.477 *n* $AlCl_3$..	0.4273
6.262 » ..	0.0577	1.8 »	0.3457	1.192 » ..	0.3291
0.49 *n* NaCl..	0.4270	2.4 »	0.3045	2.385 » ..	0.2099
0.99 » ..	0.3579	2.82 »	0.2791	4.770 » ..	0.0815
1.99 » ..	0.2496	0.495 *n* $MgCl_2$..	0.4299	0.497 *n* $LaCl_3$..	0.4360
2.99 » ..	0.1752	0.989 » ..	0.3635	1.242 » ..	0.3478
3.99 » ..	0.1199	1.979 » ..	0.2589	2.485 » ..	0.2349
0.70 *n* KCl...	0.4258	3.958 » ..	0.1308	4.970 » ..	0.1053
1.4 » ...	0.3530	0.598 *n* $CaCl_2$..	0.4180	0.978 *n* $MgSO_4$.	0.3708
2.1 » ...	0.2940	1.195 » ..	0.3408	1.956 » .	0.2632
2.8 » ...	0.2546	2.390 » ..	0.2263	2.934 » .	0.1809
1.2 *n* RbCl...	0.4075	4.780 » ..	0.0978	1.5 *n* H_2SO_4...	0.3760
1.8 » ...	0.3665	0.4 *n* $BaCl_2$....	0.4449	1.5 *n* HCl.....	0.3520
2.4 » ...	0.3413	1.2 »	0.3417	1.5 *n* Na_2SO_4..	0.2976
0.578 *n* CsCl..	0.4983	1.5 »	0.3068	0.2 *n* Mannitol..	0.5030
0.867 » ..	0.4961	1.6 »	0.2983	0.4 » ..	0.4925
1.733 » ..	0.4913	2.0 »	0.2606	0.6 » ..	0.4828
				0.8 » ..	0.4721

Solubility of Hydroquinol in Aqueous Solutions of Salts at 23°.75.

(Linderstrom-Lang, 1924.)

Aq. solvents 0.01 *n* HCl + :	Gm. mols. $C_6H_4(OH)_2$ per liter sat. sol.	Aq. solvents 0.01 *n* HCl + :	Gm. mols. $C_6H_4(OH)_2$ per liter sat. sol.	Aq. solvents 0.01 *n* HCl + :	Gm. mols. $C_6H_4(OH)_2$ per liter sat. sol.
0.0.....	0.6144 (1)	1.5 *n* KI.....	0.458 (1)	1.438 » ...	0.5890
0.0.....	0.6180	1.5 *n* KNO_3...	0.4912 (1)	0.598 *n* $CaCl_2$..	0.5072
0.669 *n* LiCl..	0.4844	0.5 *n* K_2SO_4..	0.4788 (1)	1.195 » ..	0.4177
1.338 » ..	0.3787	0.4 *n* NaCl....	0.5353	2.390 » ..	0.2786
2.676 » ..	0.2324	0.8 »	0.4631	3.585 » ..	0.1850
4.113 » ..	0.1427	1.6 »	0.3487	0.4 *n* $BaCl_2$....	0.5385
0.7 *n* KCl	0.5132	3.2 »	0.1950	0.8 »	0.4724
1.4 »	0.4278	0.479 *n* CsCl...	0.6045	1.2 »	0.4139
2.8 »	0.3010	0.959 » ...	0.5964	1.6 »	0.3606
1.5 *n* KBr....	0.4351 (1)				

(1) Kruyt and Robinson, 1926.

Equilibrium in the System Hydroquinol, Phenol and Water

(Leone and Angelescu, 1922.)

Synthetic mixtures of weighed amounts of the three components were made and the temperatures of clearing and of clouding of each were determined. Different amounts of phenol were first added to known concentrations of aqueous hydroquinol and then different amounts of hydroquinol were added to known concentrations of aqueous phenol solutions.

Aq. 1.02 % $C_6H_4(OH)_2$.

t°.	Gms. C_6H_5OH per 100 gms. mixture.
22.0.....	8.68
53.6.....	15.14
60.6.....	21.90
62.4.....	27.52
63.0.....	33.42
63.4.....	40.00
63.0.....	45.10
61.8.....	49.17
58.4.....	54.69
54.2.....	58.32
48.4.....	62.23
37.2.....	66.37
32.0.....	66.89

Aq. 4.77 % $C_6H_4(OH)_2$.

t°.	Gms. C_6H_5OH per 100 gms. mixture.
34.0.....	16.05
42.6.....	21.54
47.4.....	27.84
50.8.....	36.18
52.2.....	40.88
53.0.....	44.88
52.6.....	47.78
49.2.....	55.03
45.6.....	58.08
40.8.....	61.44
32.6.....	65.13
26.6.....	57.13

Aq. 9.16 % $C_6H_4(OH)_2$.

t°.	Gms. C_6H_5OH per 100 gms. mixture
24.2.....	25.52
34.4.....	34.82
40.4.....	45.92
40.0.....	52.14
36.8.....	57.44
28.6.....	62.18

Aq. 13.41 % $C_6H_4(OH)_2$.

t°.	Gm. $C_6H_5(OH)_2$ per 100 gm. mixture.
16.6.....	33.94
24.0.....	40.99
27.0.....	46.02
27.0.....	52.57
15.6.....	62.65

Aq. 13.2 % C_6H_5OH.

t°.	Gms. $C_6H_4(OH)_2$ per 100 gms. mixture.
53.6.....	–
49.6.....	0.62
44.0.....	1.93
33.6.....	2.82
30.8.....	3.17
29.8.....	3.39
23.8.....	4.02

Aq. 36.15 % C_6H_5OH.

t°.	Gms. $C_6H_4(OH)_2$ per 100 gms. mixture.
66.4.....	–
64.8.....	0.37
62.0.....	0.95
56.8.....	1.98
47.6.....	3.72
38.8.....	5.21
30.8.....	6.44
26.0.....	7.33

Aq. 61.97 % C_6H_5OH.

	Gms. $C_6H_4(OH)_2$ per 100 gms. mixture.
51.0.....	–
48.4.....	0.52
46.2.....	1.02
40.9.....	2.08
35.0.....	3.21
33.0.....	3.51
26.8.....	4.67

EQUILIBRIUM IN THE SYSTEM HYDROQUINOL, PHENOL AND WATER AT 0° AND AT 10°.
(Leone and Angelescu, 1922.)

The isotherms for this system were determined at 0° and at 10° using the titration method with weight pipets.

Results at 0°.

Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
$C_6H_4(OH)_2$.	C_6H_5OH.	$C_6H_4(OH)_2$.	C_6H_5OH.
0.0	7.23	11.50	39.96
1.82	8.67	11.42	44.16
3.04	8.97	11.05	47.93
4.37	10.09	9.67	54.92
6.66	13.49	7.34	60.77
8.76	18.94	5.31	66.10
9.85	23.38	3.78	69.01
10.80	34.17	1.32	73.31
11.25	39.37	0.0	75.42

Results at 10°.

Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
$C_6H_4(OH)_2$.	C_6H_5OH.	$C_6H_4(OH)_2$.	C_6H_5OH.
0.0	7.40	9.39	46.70
0.42	8.23	8.71	51.07
4.14	10.54	8.14	54.91
7.99	20.04	7.14	58.69
9.29	28.01	5.17	63.65
10.07	40.17	3.27	67.80
10.05	42.80	0.99	72.00
9.59	44.18	0.0	73.34

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given for mixtures of hydroquinol and each of the following compounds :

Triphenyl methane (Kremann, Odelga and Zawodsky, 1921.)

β Naphthylamine (Kremann and Csanyi, 1916.)

α Nitro naphthalene, Pyro catechol, Resorcinol (Senden, 1923.)

Dimethyl oxalate (Kremann, Zechner and Drâzil, 1924.)

m Amino phenol (Kremann and Lupfer, 1920.)

o, *m* and *p* Phenylene diamine (Kremann and Strohschneider, 1918.)

Paraquinone, Quinone (Kremann, Sutter, Sitte, Strzelba and Dobolzky, 1922.)

Salicyl aldehyde (Kremann and Zechner, 1925.)

Succinic Acid (Kremann, Zechner and Drâzil, 1924.)

Succinimide (Kremann and Dietrich, 1923.)

Similar data are given by Giua and Marcellino, 1920, for mixtures of *Hydroquinol Dimethylic Ether* and each of the following compounds : 1.3 dinitrobenzene, 2.4 dinitrotoluene, α trinitrotoluene and picric acid.

INDOL $C_6H_4\langle{}^{CH}_{NH}\rangle CH$.

100 gms. abs. Alcohol dissolve 35.85 gms. C_8H_7N at 20–25° (Pucher and Dehn, 1921.)
» Quinoline » 11.39 » »
» Equi. mol. mixture of alcohol and quinoline dissolve 12.0 gms. C_8H_7N at 20–25°.

IODINE I_2.

SOLUBILITY OF IODINE IN WATER.

t°.	Gm. mols. I_2 per liter sat. sol.	Gms. Iodine per liter sat. sol.	Authority.
10.0.....	0.000836	0.2113	(Carter, 1925.)
25.0.....	0.001321	0.3353	»
25.....	0.00131	0.334	(Oliveri-Mandala and Angenica, 1920.)
25.....	0.001329	0.3374	(Pearce and Eversole, 1924.)
35.....	0.001809	0.4591	(Carter, 1925.)

The determinations of Carter were made in water containing sufficient acid to give a hydrogen ion value of p_H 5.

Solubility of Iodine in Aqueous Solutions of Barium Iodide at 25°.

(Pearce and Eversole, 1924.)

Gm. mols. per 1000 gms. H_2O		Gm. mols. per 1000 gms. H_2O	
BaI_2.	I_2.	BaI_2.	I_2.
0.0000	0.001329	0.16497	0.16872
0.000686	0.002044	0.34880	0.39500
0.003120	0.004482	0.39633	0.45460
0.006287	0.007574	0.57189	0.81690
0.031674	0.032199	0.87640	1.4674
0.047716	0.048413	1.1922	2.2880
0.080477	0.079370		

Solubility of Iodine in Aqueous Solutions of Hydrobromic Acid, Hydrochloric Acid and of Hydriodic Acid.

(Oliveri-Mandala and Angenica, 1920.)

In aq. HBr at 25°.		In aq. HCl at 25°.4.		In aq. HI at 25°.2.	
Gm. mols. per liter		Gm. mols. per liter		Gm. mols. per liter	
HBr.	I_2.	HCl.	I_2.	HI.	I_2.
0.500	0.0081	0.500	0.00170	0.0604	0.0295
0.635	0.0096	1.1230	0.00256	0.0922	0.0459
1.2433	0.0203	1.5540	0.00320	0.1209	0.0610
1.8649	0.0328	1.8010	0.00373	0.2110	0.1117
2.7973	0.0514	2.0539	0.00430	0.3120	0.1633
3.7297	0.0750	2.5530	0.00511	0.4230	0.2358
		2.3139	0.00640	0.5000	0.3000
		3.8550	0.00730	0.6350	0.3950

Results for the solubility of iodine in aq. HCl solutions at 25°, which do not agree with the above, are given by Rây and Sarkar, 1922.

Solubility of Iodine in Aqueous Solutions of Nitric Acid.

(Carter, 1925.)

Results at 10°.		Results at 25°.		Results at 35°.	
Wt. per cent HNO_3.	Gm. mols. I_2 per liter.	Wt. per cent HNO_3.	Gm. mols. I_2 per liter.	Wt. per cent HNO_3.	Gm. mols. I_2 per liter.
11.80	0.000969	10.91	0.00160	3.31	0.00187
23.88	0.001035	23.16	0.00179	6.50	0.00204
32.35	0.001020	33.62	0.00186	15.50	0.00233
40.82	0.000985	42.28	0.00185	28.72	0.00260
49.57	0.000957	52.77	0.00189	42.63	0.00275
55.82	0.000962	63.81	0.00236	43.13	0.00273
64.30	0.00108	69.65	0.00312	58.37	0.00368
70.00	0.00178	72.60	0.00394		

Solubility of Iodine in Aqueous Solutions of Sodium Chloride and of Sodium Nitrate. (Carter, 1925.)

Results for Sodium Chloride at 25°.		Results for Sodium Nitrate at 25°.		Results for Sodium Nitrate at 35°.	
Wt. per cent NaCl.	Gm. mols. I_2 per 1000 gm. mols. H_2O.	Wt. per cent $NaNO_3$.	Gm. mols. I_2 per 1000 gm. mols. H_2O.	Wt. per cent $NaNO_3$.	Gm. mols. I_2 per 1000 gm. mols. H_2O.
4.52	0.04403	5.89	0.0222	1.98	0.0327
7.43	0.05295	11.10	0.0202	3.48	0.0320
14.14	0.06289	15.31	0.0185	6.85	0.0302
20.31	0.06311	25.67	0.0145	15.89	0.0268
23.15	0.06105	29.75	0.0125	29.06	0.0201
25.95	0.05790	35.43	0.0108	40.17	0.0143
		39.83	0.00911	50.1	0.0100
		44.16	0.00753		

Solubility of Iodine in Aqueous Solutions of Mono Sodium Phosphate and of Sodium Sulfate. (Carter, 1925.)

Results for $NaH_2(PO_4)_2$ at 25°.		Results for Na_2SO_4 at 25°.		Results for Na_2SO_4 at 35°.	
Wt. per cent $NaH_2(PO_4)_2$.	Gm. mols. I_2 per 1000 gms. mols. H_2O.	Wt. per cent Na_2SO_4.	Gm. mols I_2 per 1000 gms. mols. H_2O.	Wt. per cent Na_2SO_4.	Gm. mols. I_2 per 1000 gms. mols. H_2O.
7.53	0.0194	5.66	0.0173	1.05	0.0318
14.40	0.0161	8.64	0.0144	4.93	0.0252
20.64	0.0135	16.24	0.00855	9.13	0.0202
26.4	0.0111	19.66	0.00656	14.79	0.0133
31.66	0.00893			21.10	0.00839
41.06	0.0043			25.31	0.00585
45.26	0 0018			33.10	0.00258

Solubility of Iodine in Aqueous Solutions of Sulfuric Acid at 25°. (Carter, 1925.)

Wt. per cent H_2SO_4.	Gm. mols. I_2 per liter.	Color of solution.	Wt. per cent H_2SO_4.	Gm. mols. I_2 per liter.	Color of solution.
11.87	0.00102	Brown	59.53	0.000380	Pinkish + brown
22.72	0.00082	»	72.04	0.000270	Pink
33.25	0.000615	»	87.37	0.000200	»
40.42	0.000545	» + Pinkish			

Solubility of Iodine in Aqueous Solutions of Potassium Iodide at 25°. (Linhart, 1918.)

Mols. KI per 1000 gms. H_2O.....	0.4136	0.5954	0.8065	1.0246
Mols. I_2 »	0.2313	0.3538	0.5176	0.7079

Solubility of Iodine in Aqueous Solutions of Ethyl Alcohol at 15°. (Schoorl and Regenbogen, 1919.)

Due to the ready formation of HI, accurate determinations of the solubility of iodine in aqueous alcohol can be made best by diluting a solution of iodine in absolute alcohol with water, and determining immediately the C_2H_5OH and iodine content of the resulting solution. At concentrations of alcohol less than 18 per cent the addition of water does not precipitate iodine from its saturated solution. The maximum precipitation of iodine occurs when just enough water is added to bring the alcohol concentration to 18 per cent.

The determinations were plotted and the following values read from the curve.

Wt. per cent C_2H_5OH in aq.-alc. solvent.	Gms. I per 100 gms. solvent.	Wt. per 100 C_2H_5OH in aq.-alc. solvent.	Gms. I per 100 gms. solvent.	Wt. per 100 C_2H_5OH in aq.-alc. solvent.	Gms. I per 100 gms. solvent.
0.0	0.025	35.0	0.35	70.0	4.3
5.0	0.033	40.0	0.55	75.0	5.6
10.0	0.045	45.0	0.80	80.0	7.2
15.0	0.06	50.0	1.20	85.0	9.0
20.0	0.08	55.0	1.70	90.0	11.4
25.0	0.11	60.0	2.30	95.0	14.8
30.0	0.20	65.0	3.20	100.0	20.0

Note. — In connection with the results of Mc Lauchlan, 1903, given at the top of page 329 of the preceding volume of this compilation, it should be mentioned that since his value for water was apparently too low, the figure 0.034 gm. per 100 cc. was substituted and used as the basis for calculating the remaining results which he gives for the solubility of iodine in aqueous alcohol and acetic acid.

100 gms. glycerol of $d = 1.2326$ (= 86.5 %) dissolve 0.47 gm. I at 20° (Holm, 1921-1922.)
» $d = 1.2645$ (= 98.5 %) » 0.67 » »

Distribution of Iodine Between Water and Carbon Tetrachloride at 25°.

Results of Linhart, 1918.

Gm. mols. I_2 per 1000 gms.		$\frac{C}{W}$
H_2O layer (W).	CCl_4 layer (C).	
0.000402	0.022988	57.2
0.000623	0.035260	56.6
0.000724	0.040828	56.4
0.000754	0.043020	57.1
0.000907	0.051304	56.6

Results of Pearce and Eversole, 1924.

Gms. I_2 per 1000 gms.		$\frac{C}{W}$
H_2O layer (W).	CCl_4 layer (C).	
0.0745	3.8990	52.35
0.1020	5.3584	52.53
0.1078	5.6775	52.64
0.1432	7.5145	52.49
0.2432	12.6950	52.21

Data for the distribution of iodine between aqueous solutions of barium iodide and carbon tetrachloride at 25° are given by Pearce and Eversole, 1924.

Data for the distribution of iodine between aqueous solutions of hydrobromic acid and carbon tetrachloride at 30°, and between aqueous solutions of hydrochloric acid and carbon disulfide at 25° are given by Rây and Sarkar, 1922.

Distribution of Iodine (When an Excess is Present) at 25° Between: (Schilow and Lepin, 1922.)

Water and Chloroform.

Gms. I per 100 cc. saturated		$\frac{C}{W}$
H_2O layer (W).	$CHCl_3$ layer (C).	
0.0425	2.97	70

Water and Toluene.

Gms. I per 100 cc. saturated		$\frac{T}{W}$
H_2O layer (W).	Toluene layer T.	
0.036	3.50	97.5

Distribution of Iodine at Room Temperature Between Aqueous Starch Solutions and Chloroform. (Firth and Watson, 1922.)

Ten cc. of a chloroform solution of iodine was shaken with 10 cc. of the starch solution for 10 minutes and, after separation of the two layers, the iodine remaining in the $CHCl_3$ layer was determined by titration with standard thiosulfate solution.

	Gms. I per liter in the starch solution containing			
Gms. I per liter in the original $CHCl_3$ sol.	4 gms. starch per liter.	2 gms. starch per liter.	1 gm. starch per liter.	0.5 gm. starch per liter.
0.15204	0.02534	0.015175	0.007587	0.004434
0.1267	0.02281	0.011405	0.006335	0.003794
0.11403	0.02154	0.010135	0.006335	0.003167
0.10136	0.02027	0.010135	0.005712	0.002534
0.08869	0.01901	0.009505	0.005068	0.002534
0.07602	0.01584	0.008235	—	—

The results show that the amount of iodine withdrawn from the $CHCl_3$ is proportional to the concentration of the starch. The authors also give results showing the effect of various amounts of KI in the starch solution upon the amount of iodine withdrawn from the $CHCl_3$.

Solubility of Iodine in Acetone and in Benzene.

Results for Acetone. (Jacek, 1915.)

t°.	Gms. I per 100 gms. $CH_3.CO.CH_3$.	t°.	Gms. I per 100 gms. $CH_3.CO.CH_3$.
—84.....	2.73	—34.....	6.54
—75.....	6.76	—30.....	5.30
—70.5...	8.83	—22.5...	4.5
—54.75..	15.06	—18.0...	4.25
—53.5...	13.5	—16.0...	3.9
—51.0...	12.1	— 5.0...	2.66
—44.5...	8.6	0.0...	2.56
—42.0...	8.6		

Results for Benzene. (Hildebrand and Jenks, 1920.)

t°.	Gms. I per 100 gms. sat. sol.	Mols. I_2 per 100 mols. sat. sol.
25.....	14.09	0.0480
30.....	16.10	0.0558
35.....	17.90	0.0629
40.....	20.05	0.0716
45.....	22.78	0.0832
50.....	25.51	0.0953
54.64..	28.26	0.1081

100 gms. sat. sol. of iodine in bromoform contain 3.22 gms. I at 5°.6. (Amadori, 1922.)

Solubility of Iodine in Carbon Tetrachloride.

(Jacek, 1926; Hildebrand and Jenks, 1920.)

t°.	Gms. I per 100 gms. CCl_4.	t°.	Gms. I per 100 gms. CCl_4.	t°.	Gms. I per 100 gms. CCl_4.
−24.75....	0.254	−16.5....	0.352	− 7.25....	0.527
−24.0.....	0.257	−14.5....	0.375	− 6.00....	0.539
−22.0.....	0.270	−11.25...	0.447	− 2.75....	0.632
−19.0.....	0.297	− 9.5....	0.466	0.0.....	0.733
−18.5.....	0.319	− 8.5....	0.480	0.0.....	0.693 (H. and J.)
−17.0.....	0.327	− 8.25...	0.496	35.0.....	2.667 »
				50.0.....	4.547 »

Solubility of Iodine in Carbon Disulfide. (Jacek, 1915.)

t°.	Gms. I per 100 gms. CS_2.	t°.	Gms. I per 100 gms. CS_2.	t°.	Gms. I per 100 gms. CS_2.
−107.....	0.158	−69.....	0.520	−29.5.....	2.597
− 80.....	0.255	−51.....	1.089	−22.25.....	3.541
− 77.5....	0.342	−45.....	1.361	−15.75.....	4.544
− 71.5....	0.422	−35.25....	2.007	− 5.....	6.788
				0.....	8.385

Solubility of Iodine in Chloroform.

(Below 0°, Jacek, 1915; above 0°, Grimbert, Malmy and Poirot, 1924; Malmy, 1926.)

t°.	Gms. I per 100 gms. $CHCl_3$.	t°.	Gms. I per 100 gms. $CHCl_3$.	t°.	Gms. I per 100 gms. $CHCl_3$.
−60.....	0.089	−9.....	0.856	10.....	1.805 (G. M. and P.)
−51.....	0.128	−5.....	1.054	15.....	2.176 »
−45.5....	0.180	−1.....	1.198 (M.)	19.....	2.533 »
−35.0....	0.243	0.....	1.240	20.....	2.630 »
−30.....	0.372	0.....	1.237 (M.)	24.....	3.092 »
−25.....	0.404	+0.5...	1.267 (M.)	25.....	3.200 (3.38*)
−22.25....	0.514	5.0...	1.483 (G. M. and P.)	30.....	3.836 (M.)

* Gms. per 100 cc. sat. sol. at 25° (Schilow and Lepin, 1922.)

100 gms. chloroform for anasthesia, containing 0.005 per cent C_2H_5OH, dissolve 2.19 gm. I at 15°. (G. M. and P.)

Solubility of Iodine in Ethyl Ether. (Jacek, 1915.)

t°.	Gms. I per 100 gms. $(C_2H_5)_2O$.	t°.	Gms. I per 100 gms. $(C_2H_5)_2O$.	t°.	Gms. I per 100 gms. $(C_2H_5)_2O$.
−108.....	15.10	−51.....	16.44	−21.....	20.38
− 94.5....	15.43	−47.....	17.08	−19.5....	20.80
− 83.25...	15.46	−40.25 ..	17.67	−14.75...	21.59
− 75.....	15.67	−34.75...	18.64	0.0....	26.08
− 63.....	16.16	−24.5....	19.67		

Solubility of Iodine in Heptane. (Hildebrand and Jenks, 1920.)

t°.	Gms. I per 100 gms. sat. sol.	Mols. I_2 per 100 mols. sat. sol.
0.....	0.6176	0.00245
25.....	1.702	0.006786
35.....	2.491	0.00998
50.....	4.196	0.01699

Solubility of Iodine in Normal Pentane and in Iso Pentane.

(Jacek, 1926.)

Results for Normal Pentane.

t°.	Gms. I per 100 gms. $CH_3CH_2{}_3CH_3$.	t°.	Gms. I per 100 gms. $CH_3(CH_2)_3CH_3$.
−71.25..	0.018	−26.75..	0.160
−69.75..	0.021	−26.0...	0.171
−54.25..	0.042	−15.25..	0.297
−48.75..	0.057	− 7.0...	0.423
−45.25..	0.067	− 5.5...	0.483
−40.75..	0.078	0.0...	0.605
−34.25..	0.113	+19.0...	1.377

Results for Iso Pentane.

t°.	Gms. I per 100 gms. $(CH_3)_2CHCH_2CH_3$.	t°.	Gms. I per 100 gms. $(CH_3)_2CHCH_2CH_3$.
−79.25..	0.017	−31.5...	0.117
−66.25..	0.018	−25.25..	0.155
−56.00..	0.033	−23.5...	0.172
−49.0...	0.039	−21.0...	0.200
−42.5...	0.063	−10.0...	0.345
−37.5...	0.080	− 8.0...	0.381
−36.95..	0.089	− 8.0...	0.375
34.25..	0.096	0.0...	0.562

100 cc. sat. sol. of iodine in toluene contain 3.56 gms. I at 25°.
(Schilow and Lepin, 1922.)

Bromoform simultaneously saturated with iodine and sulfur contains 3.7 gms. I and 4.2 gms. S per 100 gms. sat solution at 3.65°. (Amadori, 1922.)

Reciprocal Solubility of Iodine and Sulfur in Benzene and in Carbon Disulfide at 25°. (Amadori, 1922.)

Results for Benzene.

Gms. per 100 gms. sat. sol. I.	S.	Solid Phase.
15.79	0.0	I
16.08	0.40	»
16.28	1.75	»
16.42	2.58	I + S
12.72	2.42	S
8.31	2.35	»
0.0	2.09	»

Results for Carbon Disulfide.

Gms. per 100 gms. sat. sol. I.	S.	Solid Phase.
19.14	0.0	I
19.83	7.76	»
20.64	12.83	»
21.45	27.73	»
22.11	36.74	»
22.64	40.82	S + I
16.08	39.56	S
9.24	37.12	»
6.62	36.42	»
0.0	34.76	»

Data for the reciprocal solubility of iodine and sulfur in carbon disulfide at 10° and at 18° are given by Mori, 1923. This author also found no evidence of the existence of compounds of iodine and sulfur.

Freezing-Points of Mixtures of Iodine and Iodoform.

(Vasilev, 1916.)

t°.	I content of mixture. Wt. %.	Atom %.	Solid Phase.
114.0....	100.0	100.0	I
97.8....	87.84	95.70	»
94.8....	85.38	94.82	»
79.8....	70.22	87.98	»
73.6....	59.41	81.96	»
71.2....	53.30	77.96	»
69.5....	49.08	74.94	»
66.1 (Eutec.).	42.3	–	$I+CHI_3$
70.9.....	38.85	66.33	CHI_3
78.1.....	31.45	58.76	»
86.2.....	24.63	50.35	»
95.8.....	17.63	39.40	»
111.9.....	5.20	14.55	»
119.7.....	0.0	0.0	»

Similar data for iodine + naphthalene gave a single eutectic at 65°.7 and 39.43 wt. % I.

Freezing-point data for mixtures of iodine and stannic iodide gave a single eutectic at 77°.8 and 12.0 atom per cent Sn (Vasilev, 1917). Data for mixtures of $I + CH_3I$ and $I + C_{10}H_8$ (naphthalene) are given by Vasilev, 1917, 1925. Data for mixtures of iodine and tellurium are given by Damiens, 1921, 1923.

IODINE PENTOXIDE I_2O_5.

Solubility of Iodine Pentoxide in Sulfuric Acid at 24°.77.

(Lamb and Phillips, 1923.)

Constant rotation in a thermostat was employed. Equilibrium was reached in some cases within one day, but with higher concentrations of sulfuric acid, there was a slow decrease from a definite initial solubility. This was studied over a period of 55 days and constancy was reached in all cases within 40 days.

Per cent conc. of H_2SO_4.	Gms I_2O_5 per liter		Per cent conc. of H_2SO_4.	Gms I_2O_5 per liter	
	Initial.	Final.		Initial.	Final.
50.0.....	54.79	54.79	89.0.....	22.1	15.1
60.0.....	34.68	34.68	90.3.....	22.7	14.5
75.0.....	19.48	19.48	92.0.....	23.4	13.5
78.0.....	18.66	18.66	96.0.....	(23.2)	11.0
79.6.....	19.0	18.5	98.0.....	(22.0)	9.5
82.0.....	19.9	18.8	99.9.....	–	3.48
84.6.....	20.5	19.3	102.0*.....	–	1.28
86.0.....	21.0	17.1	104.0.....	–	1.99
87.4.....	21.5	15.8	106.0.....	–	2.67

* This percentage represents weights of 100 % H_2SO_4 equivalent to 100 gm. of the acid in question. The 106.5 % of acid, therefore, contained 29.0 % of free SO_3.

IODOFORM CHI_3

Definite weights of 95 % glycerol ($d_{18} = 1.255$) and $CH I_3$ were heated 2 hours under a reflux condenser and the solution rapidly filtered and cooled to 15°. A definite weight of it was analyzed by adding standard silver nitrate and titrating the excess with sulfocyanate. The solubility was found to be 0.123 gms. $CH I_3$ per 100 gms. sat. sol. at 15°.

Increase in temperature or use of more concentrated glycerol did not greatly increase this result. (Chiaria, 1917, 1919.)

Freezing-point data for mixtures of iodoform and naphthalene gave a single eutectic at 70°.8 and 43.53 wt. per cent $CH I_3$. (Vasilév, 1916.)

IRIDIUM DOUBLE SALTS

Solubility of Each in Water at 20° (Benrath, 1924.)

Compound.	Formula.	Gms. cmpd. per 100 cc. H_2O.	Gms. mols. cmpd. per liter sat. sol.
Mono quinine hexa chlor iridate...	$C_{20}H_{24}N_2O_2.H_2IrCl_6$	0.0439	$6.0.10^{-4}$
» » » brom » ...	$C_{20}H_{24}N_2O_2H_2IrBr_6$	0.0174	$1.7.10^{-4}$
Di quinine » chlor » ...	$(C_{20}H_{24}N_2O_2)_2.H_2IrCl_6$	0.0012	$1.2.10^{-5}$
Mono cinchonine » » » ...	$C_{19}H_{22}N_2O.H_2IrCl_6$	0.1263	$1.8.10^{-3}$
» » » brom » ...	$C_{19}H_{22}N_2O.H_2IrBr_6$	0.0062	$6.5.10^{-5}$
Di cinchonine » chlor » ...	$(C_{19}H_{22}N_2O)_2.H_2IrCl_6$	0.0037	$3.5.10^{-5}$
Mono cinchonidine » » » ...	$C_{19}H_{22}N_2O.H_2IrCl_6$	0.0277	$3.9.10^{-4}$
» » » brom » ...	$C_{19}H_{22}N_2O.H_2IrBr_6$	0.0048	$5.0.10^{-5}$
Di cinchonidine » chlor » ...	$(C_{19}H_{22}N_2O).H_2IrCl_6$	0.0034	$3.4.10^{-5}$
Strychnine » » » ...	$(C_{21}H_{22}N_2O_2)_2H_2IrCl_6$	0.0045	$4.3.10^{-5}$
» » brom » ...	$(C_{21}H_{22}N_2O_2)_2H_2IrBr_6$	0.0015	$1.2.10^{-5}$
Brucine » chlor » ...	$(C_{23}H_{26}N_2O_4)_2H_2IrCl_6$	0.0083	$7.0.10^{-5}$
» » brom » ...	$(C_{23}H_{26}N_2O_4)_2H_2IrBr_6$	0.0015	$1.2.10^{-5}$
Nitron » chlor » ...	$(C_{20}H_{16}N_4)_2.H_2IrCl_6$	0.0082	$8.0.10^{-5}$
» » brom » ...	$(C_{20}H_{16}N_4)_2.H_2IrBr_6$	0.0086	$1.2.10^{-5}$

IRON BROMIDE (Ferrous) $FeBr_2$.

100 cc. pyridine dissolve 0.49 gm. $FeBr_2$ at 25°. (R. Müller, 1924.)

IRON CARBONATE (Ferrous) $FeCO_3$.

100 gms. of a sat. solution of $FeCO_3$ in water at 18° and in contact with CO_2 at a pressure of 1 atmosphere contain 0.072 gm. $FeCO_3$. At a pressure of 56 atmospheres of CO_2, 0.077 gm. $FeCO_3$ are dissolved. (Hachnel, 1924.)

IRON CHLORIDE (Ferric) $FeCl_3.6H_2O$.

A theoretical discussion of the system ferric chloride, ferric oxide and water, especially of the phase diagram above 400°, is given by Baur, 1926.

EQUILIBRIUM IN THE SYSTEM FERRIC CHLORIDE, ANILINE HYDROCHLORIDE, HYDROCHLORIC ACID AND WATER AT 25°. (Osaka, Shima and Yoshida, 1924.)

The mixtures were constantly rotated at 25°. Both the liquid phase and the solid residues were analyzed.

Gms. per 100 gms. sat. sol.				Gms. per 100 gms. sat. sol.			
$C_6H_5.NH_2.HCl$.	$FeCl_3$.	HCl.	Solid Phase.	$C_6H_5.NH_2.HCl$.	$FeCl_3$.	HCl.	Solid Phase.
11.29	0.20	21.20	–	13.81	5.18	11.32	$FeCl_3.6C_6H_5NH_2.HCl$
12.46	0.49	19.57	–	10.92	8.51	10.82	»
10.77	0.11	21.64	–	8.85	8.83	12.66	»
8.94	1.35	19.41	–	7.06	12.12	11.44	»
7.11	0.69	22.48	–	7.09	14.30	10.21	»
5.85	1.10	23.87	–	5.29	16.06	11.69	»
5.05	1.86	22.03	–	4.49	18.16	11.91	»
4.61	3.01	22.28	–	3.96	19.95	11.49	»
3.99	3.35	23.04	–	3.57	21.50	12.89	–
4.05	3.58	22.35	–	3.45	22.84	11.22	–
5.59	6.37	19.17	–	3.47	23.82	10.21	–
3.44	6.31	22.36	–	2.58	23.36	12.96	$FeCl_3.2C_6H_5NH_2.HCl$
				2.10	25.59	12.48	»
22.78	0.0	11.08	$FeCl_3.6C_6H_5NH_2.HCl$	2.07	26.20	12.53	»
20.24	1.29	11.78	»	1.77	28.61	11.71	»
18.09	1.03	13.02	»	1.35	33.10	10.98	»
19.59	1.31	12.08	»	1.57	35.17	7.22	–
17.19	2.82	11.88	»	1.34	36.24	7.52	–

DISTRIBUTION OF FERRIC CHLORIDE BETWEEN WATER AND ETHYL ETHER AT 18°. (De Kolossowsky, 1925.)

Gm. mols. $FeCl_3$ per liter		Gm. mols. $FeCl_3$ per liter		Gm. mols. $FeCl_3$ per liter	
H_2O layer.	$(C_2H_5)_2O$ layer.	H_2O layer.	$(C_2H_5)_2O$ layer.	H_2O layer.	$(C_2H_5)_2O$ layer.
1.017	0.00216	1.624	0.0163	2.455	0.888
1.100	0.00259	1.907	0.0617	2.389	0.868
1.217	0.00382	2.062	0.110	2.432	0.925
1.404	0.0048	2.158	0.313	2.833	1.281
1.420	0.0068	2.210	0.579	2.873	1.371
1.515	0.0080	2.213	0.704	3.581	1.939
1.504	0.0117	2.442	0.837		

100 gms. sat. sol. of ferric chloride in selenium oxychloride ($SeOCl_2$) contain 23.4 gms. $FeCl_3$ at 25°. (Wise. 1923.)

IRON HELIANTHATE (Ferrous and Ferric).

1000 cc. H_2O dissolve 0.109 gm. $Fe(C_{14}H_{14}N_3SO_3)_2.4H_2O$ (ous salt.) at 20-25°.
» » 0.118 » $Fe(C_{14}H_{14}N_3SO_3)_3.6H_2O$ (ic salt.) »
(Stark and Dehn, 1918.)

IRON HYDROXIDE (Ferric) $Fe(OH)_3$ (Ferrous) $Fe(OH)_2$.

Using electrical methods, Jellinek and Gordon found the solubility of ferric hydroxide in water to be 3.10^{-10} gm. mol. Fe $(OH)_3$ per liter.

Using ordinary distilled water containing a little CO_2 and evaporating 2 liters of the saturated solution obtained by constant stirring, Almkvist, 1918, found 0.000151 gms. Fe $(OH)_3$ per liter.

Solubility of Ferrous Hydroxide in Water and in Aqueous Salt Solutions at 25°. (Whitman, Russell and Davis, 1925.)

Solutions of ferrous hydroxide were prepared by adding pure iron powder to the deoxygenated solutions in which the solubility of ferrous hydroxide was to be determined. The solutions were allowed to stand at 40° for 18 hours and then cooled to 25°. No mention is made of constant stirring. The filtration was performed in presence of hydrogen. The dissolved iron was determined colorimetrically. The results are given in the form of charts from which the following results were read.

Normality of salt sol.st.	Parts of iron per million in aqueous solution of					
	Na_2SO_4.	NaCl.	$CaCl_2.6H_2O$.	$CaCl_2$(Anhy.).	NH_4Cl.	$MgCl_2$.
0.0(=H_2O).	3.75	3.75	3.75	3.75 (9.6)	3.75 (9.6)	3.75 (9.6)
0.5.....	4.5	4.1	4.2	2.0 (9.9)	60.0 (5.2)	7.5
1.0.....	4.5	4.2	4.5	1.6 (10.3)	100.0 (4.9)	10.0 (5.9)
1.5.....	4.0	4.25	4.6	1.4	135.0	12.0
2.0.....	2.6	4.2	4.7	1.25 (10.4)	170.0	15.0 (5.7)
2.5.....	—	4.15	4.8	1.05	190.0	20.0
3.0.....	—	4.0	—	0.95	220.0	22.0
4.0.....	—	3.75	—	0.75	265.0 (4.5)	25.0
4.5.....	—	—	—	0.70 (10.5)	—	24.0 (5.4)

The figures in parentheses are the p_H values of the saturated solutions.

Results are given for aqueous solutions of sodium dichromate which show that less than 0.2 part per million of iron is dissolved. The results for the solubility in aqueous sodium hydroxide and silicate solutions are expressed only in terms of p_H.

The value for the solubility in water alone, namely 3.75 parts of iron per million, corresponds to 6.7×10^{-5} gm. mols. Fe $(OH)_2$ per liter.

IRON PHOSPHATES (Ferric) $Fe_2O_3.P_2O_5.5H_2O$, $Fe_2O_3.2P_2O_5.8H_2O$, $Fe_2O_3.3P_2O_5.10H_2O$ and $6H_2O$.

Equilibrium in the System Ferric Oxide, Phosphoric Acid and Water at 25° and at 70°. (Carter and Hartshorne, 1923.)

The authors call attention to a source of error in the determinations of Cameron and Bell, 1907, and give the following new determinations at 25° for solutions in contact with $Fe_2O_3.P_2O_5.5H_2O$.

Gms. per 100 gms. sat. sol.					
Fe_2O_3.....	trace	0.23	1.40	2.43	4.42
P_2O_5.....	5.93	10.1	14.1	19.8	21.7

The following results were obtained at 70°.

d_{20} of sat. sol.	Gms. per 100 gms. sat. sol. Fe_2O_3.	P_2O_5.	Solid Phase.	d_{20} of sat. sol.	Gms. per 100 gms. sat. sol. Fe_2O_3.	P_2O_5.	Solid Phase.
—	trace	4.07	$Fe_2O_3.P_2O_5.XH_2O+H_3PO_4$	1.65	7.25	47.87	$Fe_2O_3.2P_2O_5.8H_2O$
—	less than 0.1	6.38	$Fe_2O_3.P_2O_5.5H_2O$	1.68	7.53	49.76	»
—	0.195	14.08	»	—	8.10	52.32	»
—	0.252	16.24	»	1.82	9.79	53.23	$Fe_2O_3.3P_2O_5.10H_2O$
—	1.08	23.56	»	1.82	9.50	54.42	»
—	1.85	27.03	»	1.82	8.68	55.84	»
—	4.49	35.46	»	1.77	5.28	58.07	$Fe_2O_3.2P_2O_5.6H_2O$
1.45	5.45	37.43	»	—	4.42	59.12	»
1.58	7.12	43.92	$Fe_2O_3.2P_2O_5.8H_2O$	—	3.46	60.47	»

IRON PHOSPHATES (Ferrous) $2FeO.P_2O_5.5H_2O$, $2FeO.P_2O_5.3H_2O$ and $FeO.P_2O_3.4H_2O$.

Equilibrium in the System Ferrous Oxide, Phosphoric Acid and Water at 70° (Carter and Hartshorne, 1926.)

The mixtures were prepared by dissolving Swedish iron (99.75 % Fe) in solutions of phosphoric acid kept in an atmosphere of CO_2. The mixtures were constantly stirred in a thermostat for at least a week and both the saturated solutions and solid phases were analyzed.

$d_{\frac{15-20}{4}}$ of sat. sol.	Gms. per 100 gms. sat. sol. FeO.	P_2O_5.	Solid Phase.	$d_{\frac{15-20}{4}}$ of sat. sol.	Gms. per 100 gms. sat. sol. FeO.	P_2O_5.	Solid Phase.
1.08	2.76 (1.2)	7.38	$2FeO.P_2O_5.5H_2O$	1.44	10.6	29.05	$2FeO.P_2O_5.3H_2O$ (amorp.)
1.16	4.38	12.06	»	1.45	10.6 (0.87)	29.46	»
1.22	5.53	14.46	»	1.54	11.3 (0.62)	32.87	»
1.20	5.48 (1.6)	14 96	»	1.55	11.5 (0.92)	33.99	»
1.24	5.54 (5.1)	15.1	»	–	11.8	35.43	»
1.31	7.71	21.6	$2FeO.P_2O_5.3H_2O$ (cryst.)	1.60	11.9 (2.75)	36.99	»
1.39	9.18 (0.84)	25.65	»	1.58	10.5 (0.7)	38.86	$FeO.P_2O_5.4H_2O$
1.43	9.88	28.25	»	1.60	8.77	41.52	»
1.53	10.99	32.78	»	–	7.38	42.88	»
1.60	11.25	37.20	»	1.61	6.29	46.61	»
1.60	11.29	37.21	»	1.63	4.87	50.49	»
–	9.12	24.29	$2FeO.P_2O_5.3H_2O$ (amorp.)	1.63	4.01	52.02	»
1.42	10.1	27.20	»	1.71	3.15 (4-6)	57.51	»

The figures in parentheses show the per cent of iron present in the ferric state.

IRON PYROPHOSPHATE (Ferric) $Fe_4(P_2O_7)_3.9H_2O$.

Solubility of Ferric Pyrophosphate in Aqueous Solutions of Sodium Pyrophosphate and of Sodium Citrate. (Oliveri-Mandala, 1921.)

In Aq. Sodium Pyrophosphate at 30°.4.

Gm. mols. $Na_4P_2O_7$ per liter.	Gm. mols. $Fe_4(P_2O_7)_3$ per liter (1).	(2).
0.14	0.047	0.050
0.20	0.068	0.072
0.26	0.088	0.094
0.32	0.108	0.114
0.38	0.124	0.134

In Aq. Sodium Citrate at 28°.

Gm. mols. per liter Na citrate.	$Fe_4(P_2O_7)_3$.
0.2004	0.1712
0.3951	0.3160
0.4760	0.3704
0.5289	0.4037
0.6355	0.4572

Solid Phase for (1) = anhydrous $Fe_4(P_2O_7)_3$, for (2) = $Fe_4(P_2O_7)_3.9H_2O$.

IRON Sodium PYROPHOSPHATE $Fe_4(P_2O_7)_3.3Na_4P_2O_7$.

Solubility of Ferric Sodium Pyrophosphate in Aqueous Solutions of Sodium Citrate and of Sodium Chloride. (Oliveri-Mandala, 1921).

In Aq. Sodium Citrate at 26°.5.

Gm. mols. per liter Na citrate.	Gm. mols. per liter $Fe_4(P_2O_7)_3.3Na_4P_2O_7$.
0.3456	0.0186
0.4760	0.0249
0.5374	0.0269

In Aq. Sodium Chloride at 30° and at 50°.5.

Gm. mols. NaCl per liter.	Gm. mols. $Fe_4(P_2O_7)_3.3Na_4P_2O_7$ per liter at 30°.	50°.5.
0.0	0.0100	0.062
0.01	0.0077	0.039
0.02	0.0053	0.023
0.03	0.0037	0.015
0.04	0.0028	0.011
0.05	0.0023	0.009
0.06	0.0020	0.009

IRON Nitroso β Phenyl HYDROXYL AMINE (Ferric).

100 gms. water dissolve 3.10^{-4} gm. of the compound at 18°. (Martin.)

IRON SULFATE (Ferrous) $FeSO_4.7H_2O$, (Ferric) $Fe_2(SO_4)_3.9H_2O$.

Solubility of Ferrous Sulfate in Water.
(Agde and Barkholt, 1926.)

t°.	d of sat. sol.	Gms. $FeSO_4.7H_2O$ per 100 gms. sat. sol.	t°.	d of sat. sol.	Gms. $FeSO_4.7H_2O$ per 100 gms. sat. sol.
1.0.....	1.140	25.25	34.0.....	1.312	48.65
9.6.....	1.178	31.32	43.0.....	1.363	55.01
21.0.....	1.233	39.02	54.0.....	1.432	63.18
25.0.....	1.255	42.08	80.0.....	1.367	55.49

Equilibrium in the System Ferric Oxide, Sulfuric Acid and Water
(Appleby and Wilkes, 1922.)

Results at 18°.

Gms. per 100 gms. sat. sol. Fe_2O_3.	Gms. per 100 gms. sat. sol. SO_3.	Solid Phase.
0.21	40.64	$Fe_2O_3.4SO_3.9H_2O$
0.91	36.45	»
6.48	32.43	»
8.00	31.85	»
9.63	30.80	»+$Fe_2O_3.3SO_3.7H_2O$
11.69	30.80	$Fe_2O_3.3SO_3.7H_2O$
13.88	29.71	»
17.48	29.73	»
18.68	29.64	»+Basic solid solut.
17.96	25.42	Basic solid solutions
14.00	17.71	»
11.60	13.85	»
6.81	7.60	»

Results at 25°.

Gms. per 100 gms. sat. sol. Fe_2O_3.	Gms. per 100 gms. sat. sol. SO_3.	Solid Phase.
0.27	39.77	$Fe_2O_3.4SO_3.9H_2O$
0.71	37.22	»
2.38	34.99	»
3.88	33.20	»
8.04	32.06	$Fe_2O_3.3SO_3.7H_2O$
10.55	30.77	»
13.80	30.02	»
17.52	29.85	$5(Fe_2O_3.3SO_3).2Fe_2O_3$
18.56	29.98	»
19.98	29.19	Basic solid solutions
19.78	27.90	»
19.55	25.99	»
15.53	17.62	»
13.51	14.58	»
7.91	8.19	»

Equilibrium in the System Ferric Oxide, Sulfuric Acid and Water at 50° to 200°. (Posnjak and Merwin, 1922.

The authors give a critical discussion of previous work on this system. Their own determinations were made with the greatest possible accuracy. The identification of the solid phases was made both microscopically and analytically. Sealed tubes were used and at temperatures above 50° the tubes were heated by means of a resistance furnace within a steel bomb. The time required for equilibrium varied from 2 months at 50° to only a week or 10 days at the higher temperatures.

Results for the Isotherm at 50°.

Gms. per 100 gms. sat. sol. Fe_2O_3.	Gms. per 100 gms. sat. sol. SO_3.	Solid Phase.
0.14	0.39	$Fe_2O_3.H_2O$
0.39	0.79	»
0.90	1.53	»
1.44	2.30	»+$3Fe_2O_3.4SO_3.9H_2O$ (?)
2.55	4.08	$3Fe_2O_3.4SO_3.9H_2O$
5.71	9.09	»
7.19	11.19	»
15.43	20.08	»
16.09	20.81	»
17.96	22.96	»+$Fe_2O_3.2SO_3.5H_2O$
20.13	27.18	$Fe_2O_3.2SO_3.5H_2O$
20.70	28.40	$2Fe_2O_3.5SO_3.17H_2O$
16.78	30.72	»+$Fe_2O_3.3SO_3.7H_2O$
10.26	31.91	$Fe_2O_3.3SO_3.7H_2O$
8.56	32.52	»
5.55	33.96	$Fe_2O_3.4SO_3.9H_2O$
0.34	41.18	»
0.10	48.44	»
0.09	55.34	»
0.07	59.20	$Fe_2O_3.4SO_3.3H_2O$
0.08	62.34	»
0.07	75.37	»

Similar data for the 75°, 110°, 140° and 200° isotherms are given and also several determinations at 130°, 150° and 300°.

Freezing-point data for mixtures of ferrous sulfate and 100 per cent sulfuric acid are given by Kendall and Davidson, 1921.

IRON Ammonium SULFATE (Ferrous) $Fe(NH_4)_2(SO_4)_2.6H_2O$.

Solubility of Mixed Crystals of Iron Ammonium Sulfate and Zinc Ammonium Sulfate in Water. (Ostersetzer, 1926.)

The two salts mix in all proportions. The influence of temperature upon the solubility is insignificant, in that the relation between the solubilities of the two salts does not change with increase of temperature.

Results at 7°.				Results at 8°.5.			
	Gms. per 1000 cc. sat. sol.		Wt. per cent $Fe(NH_4)_2SO_4.6H_2O$ in Solid Phase.		Gms. per 1000 cc. sat. sol.		Wt. per cent $Fe(NH_4)_2(SO_4).6H_2O$ in Solid Phase.
d of sat. sol.	$Fe(NH_4)_2.(SO_4)_2.6H_2O$.	$Zn(NH_4)_2.(SO_4)_2.6H_2O$.		d of sat. sol.	$Fe(NH_4)_2.(SO_4)_2.6H_2O$.	$Zn(NH_4)_2.(SO_4)_2.6H_2O$.	
1.1541	279.49	0.00	100.0	1.1578	286.52	0.00	100.0
1.1454	236.84	18.99	85.17	1.1452	243.71	24.00	87.12
1.1392	220.24	22.47	76.57	1.1366	212.66	34.99	71.40
1.1377	181.49	40.10	59.99	1.1304	183.13	45.93	56.76
1.1203	158.60	46.88	49.52	1.1184	157.54	54.60	49.51
1.1115	125.20	62.89	37.74	1.1121	133.70	63.35	38.42
1.1051	101.64	70.93	29.51	1.1035	103.70	72.95	27.46
1.0965	73.58	82.46	18.19	1.0963	78.82	81.59	18.63
1.0912	54.36	92.10	13.18	1.0891	53.45	95.04	11.56
1.0794	0.00	125.50	0.00	1.0875	27.65	112.25	5.78
				1.0798	0.00	128.30	0.00

IRON Potassium SULFATE (Ferrous) $FeK_2(SO_4)_2.6H_2O$.

Solubility of Mixed Crystals of Iron Potassium Sulfate and Zinc Potassium Sulfate in Water at 6°.8. (Haber-Chuwis, 1926.)

	Gms. per 1000 cc. sat. sol.		Mol. per cent $FeK_2(SO_4)_2.6H_2O$ in Solid Phase.
d of sat. sol.	$FeK_2(SO_4)_2.6H_2O$.	$ZnK_2(SO_4)_2.6H_2O$.	
1.2067	329.15	0.00	100.0
1.1859	275.03	19.39	93.55
1.1758	246.80	28.82	90.08
1.1606	203.22	47.62	81.98
1.1474	173.59	53.07	76.98
1.1339	142.76	63.87	69.45
1.1204	119.46	67.83	64.29
1.1085	87.69	72.46	55.30
1.0993	68.10	77.78	47.22
1.0795	0.00	113.62	0.00

IRON SULFIDE (Ferrous) FeS, (Ferric) Fe_2S_3.

1000 cc. aq. 0.01 n H_2SO_4 sat. with H_2S dissolve 0.2136 gm. Fe S at 20°. (Moser and Behr, 1924.)

1000 cc. sat. solution of ferric sulfide in water contain 3.10^{-18} gm. mol. Fe_2S_3 at room temperature determined by electrical methods. (Jellinek and Gordon, 1924.)

IRON Benzene SULFONATE (Ferrous) and Naphthalene SULFONATE.

Solubility of Each in Water.

Compound.	Formula.	t°.	Gms. anhydrous cmpd. per 100 cc. sat. sol.	Authority.
Ferrous benzene sulfonate.....	$Fe(C_6H_5SO_3)_2.6H_2O$	20	9.234	(Ephraim and Pfister, 1925.)
Ferrous naphthalene-2-sulfonate.	$Fe(C_{10}H_7SO_3)_2.6H_2O$	16.5	0.243	(Ephraim and Pfister, 1925 a.)

IRON THIOCYANATE.

Data for the distribution of iron thiocyanate between water and ether are given by Wosnessensky, 1923.

KRYPTON Kr.

Solubility of Krypton in Water. (von Antropoff, 1919.)

The following new determinations were made in a refined apparatus arranged so that the solvent and its vapor touched no cock. The previous determinations were found to be in error in the region of the minimum. The results are expressed in terms of the Bunsen coefficient as modified by Kuenen, that is the volume of gas in cc. (reduced to normal conditions) dissolved by 1.0 gm. of H_2O.

t°.	Absorp. coef β.	t°.	Absorp. coef. β.	t°.	Absorp. coef. β.	t°.	Absorp. coef. β.
0.....	0.1105	20.....	0.0626	40.....	0.0433	60.....	0.0357
10.....	0.0810	30.....	0.0511	50.....	0.0383		

LACTIC ACID $CH_3.CHOH.COOH$.

Distribution of Lactic Acid Between:

Water and Chloroform at 25°. (Smith, 1922, 1921.)

Millimols. per liter. H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
26.9	0.43	0.0160
32.8	0.60	0.0183
50.4	1.00	0.0198
79.8	1.80	0.0226

Water and Ether at 25°. (Smith, 1921, 1922.)

Millimols. per liter. H_2O layer C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
3.95	0.550	0.139
5.95	1.000	0.155
9.35	1.525	0.163
15.7	2.7	0.172
28.3	5.1	0.180

Water and Ether at 20°. (Behrens, 1926.)

Concentration in H_2O layer C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.0692	0.0056	0.0809
0.1485	0.01205	0.0811
0.298	0.02445	0.0820

Trichlor LACTIC ACID $CCl_3.CHOH.COOH$.

Solubility of Trichlor Lactic Acid in Aqueous Solutions of Hydrochloric Acid and of Sulfuric Acid at 25°.

(Knox and Richards, 1919.)

In Aq. Hydrochloric Acid.

Equiv. normality. HCl.	$C_3H_3O_3Cl_3$.	Equiv. normality. HCl.	$C_3H_3O_3Cl_3$.
0.00	4.024	7.675	0.659
1.234	2.545	8.959	0.624
2.837	1.425	10.65	0.57
4.388	0.984	11.86	0.57
5.982	0.760	12.17	0.60

In Aq. Sulfuric Acid.

Equiv. normality. H_2SO_4.	$C_3H_3O_3Cl_3$.	Equiv. normality. H_2SO_4.	$C_3H_3O_3Cl_3$.
0.0	4.024	16.18	0.15
2.525	1.896	19.38	0.18
6.166	0.671	22.28	0.21
9.588	0.353	25.34	0.26
12.75	0.26		

Trithio Carbon Di LACTYL ACID $HOOC.CH.(CH_3)S.CS.S(CH_3)CH.COOH$.

Solubility of the Stereoisomeric Forms of This Acid in Water at 25°.

(Holmberg, 1921.)

Compound.	M. pt.	Gms. cmpd. per liter sat. sol.
Meso Trithio carbon di lactyl acid	104–105°	27.4
Racem » » » »	154–155°	3.03
Dextro » » » »	136–136.5°	10.6
Laevo » » » »	–	10.6

LACTOSE (See Sugars, pages 1457-1458).

LANTHANUM ACETATE $La(CH_3COO)_3.1^1/_2H_2O$.

100 gms. H_2O dissolve 20.43 gms. $La(CH_3COO)_3$ at 18°. (Vesterberg, 1916, 1917.)
» » » 16.88 » » » 25°. (Meyer and Müller, 1920.)

LANTHANUM CHLORIDE $La Cl_3$.

Solubility of Lanthanum Chloride and of Lanthanum Oxide in Aqueous Solutions of Ammonium Chloride at 15°, 30°, 50° and 100°.
(Prandtl and Rauchenberger, 1920.)

The results are given only in the form of small scale diagrams and it is stated that the numerical data will be published in full in the dissertation of Johanna Rauchenberger, University of München, 1920. The equilibrium

$$La(OH)_3 + 3NH_4Cl \rightleftharpoons LaCl_3 + 3NH_3 + 3H_2O$$

was approached by the authors from both sides. The composition of the basic chlorides obtained by shaking the oxide with 1.0 *n* NH_4Cl at different temperatures, and drying over soda lime, was approximately as follows :

At 15°, $La_4Cl_2O_5.9H_2O$; at 30°, $La_3ClO_4.6H_2O$; at 50°, $La_8Cl_2O_{11}.16H_2O$.

LANTHANUM Potassium CHROMATE.

The system $La_2(CrO_4)_3 + K_2CrO_4 + H_2O$ at 25° was studied by Carobbi, 1924, but the table of results does not show the quantity of $La_2(CrO_4)_3$ present in the solutions. The results show the several double compounds formed.

LANTHANUM LACTATE $La(C_3H_5O_3)_3.3H_2O$.

100 cc. sat. solution of lanthanum lactate in water contain 1.44 gms. La_2O_3 [= 4.06 gms. $La(C_3H_5O_3)_3.3H_2O$] at 20°. (Jantsch, 1926.)

LANTHANUM Ammonium SULFATES.

Equilibrium in the System Lanthanum Sulfate, Ammonium Sulfate and Water at 25°. (Zambonini and Stolfi, 1926.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$La_2(SO_4)_3$.	$(NH_4)_2SO_4$.	Solid Phase.	$La_2(SO_4)_3$.	$(NH_4)_2SO_4$.	Solid Phase.
0.88	6.24	$La_2SO_{4,3}.9H_2O+1.1.2$	0.22	29.37	1.3
0.88	6.26	1.1.2	0.19	30.40	1.5
0.75	7.19	»	0.05	33.6	»
0.73	11.11	»	0.05	36.85	»
0.34	14.48	»	0.02	39.24	» +1.6
0.32	22.89	»	0.02	42.48	1.6
0.30	22.80	» +1.3	0.02	43.24	»
0.28	25.12	1.3	0.00	44.64	1.6+$(NH_4)_2SO_4$
0.26	27.97	»			

1.1.2 = $La_2(SO_4)_3.(NH_4)_2SO_4.2H_2O$; 1.5 = $La_2(SO_4)_3.5(NH_4)_2SO_4$;
1.3 = $La_2(SO_4)_3.3(NH_4)_2SO_4$; 1.6 = $La_2(SO_4)_3.6(NH_4)_2SO_4$.

LANTHANUM Potassium SULFATES.

Equilibrium in the System Lanthanum Sulfate, Potassium Sulfate and Water at 25°. (Zambonini and Carobbi, 1924.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$La_2(SO_4)_3$.	K_2SO_4.	Solid Phase.	$La_2(SO_4)_3$.	K_2SO_4.	Solid Phase.
0.87	0.23	1.1.2	0.00	1.51	1.4.1
0.77	0.23	»	0.00	1.24	»
0.41	0.45	»	0.00	1.78	1.4 1/2.2
0.28	0.79	2.3.8	0.00	10.16	»
0.26	0.74	» +1.3	0.00	11.11	1.5.2
0.24	0.87	1.3	0.00	11.02	» +K_2SO_4
0.00	1.62	» +1.4.1			

1.1.2 = $La_2(SO_4)_3.K_2SO_4.2H_2O$; 1.4.1 = $La_2(SO_4)_3.4K_2SO_4.H_2O$;
2.3.8 = $2La_2(SO_4)_3.3K_2SO_4.8H_2O$; 1.4 1/2.2 = $La_2(SO_4)_3.4\frac{1}{2}K_2SO_4.2H_2O$;
1.3 = $La_2(SO_4)_3.3K_2SO_4$; 1.5.2 = $La_2(SO_4)_3.5K_2SO_4.2H_2O$.

LANTHANUM Sodium SULFATE.

EQUILIBRIUM IN THE SYSTEM LANTHANUM SULFATE, SODIUM SULFATE AND WATER AT 25°. (Zambonini and Carobbi, 1925 *a*.)

Gms. per 100 gms. sat. sol.		Solid Phase.	Gms. per 100 gms. sat. sol.		Solid Phase.
$La_2(SO_4)_3$.	Na_2SO_4.		$La_2(SO_4)_3$.	Na_2SO_4.	
0.19	0.54	$La_2(SO_4)_3.Na_2SO_4.2H_2O$	0.0	10.46	$La_2(SO_4)_3.Na_2SO_4.2H_2O$
0.09	0.75	»	0.0	13.86	»
trace	3.42	»	0.0	15.06	»
»	5.43	»	0.0	16.28	»
»	7.13	»	0.0	18.06	»+Na_2SO_4

LANTHANUM Thallium SULFATES.

EQUILIBRIUM IN THE SYSTEM LANTHANUM SULFATE, THALLIUM SULFATE AND WATER AT 25°. (Zambonini and Carobbi, 1925.)

Gms. per 100 gms. sat. sol.		Solid Phase.	Gms. per 100 gms. sat. sol.		Solid Phase.
$La_2(SO_4)_3$.	Tl_2SO_4.		$La_2(SO_4)_3$.	Tl_2SO_4.	
1.84	0.19	$La_2(SO_4)_3.9H_2O$+1.1.2	0.15	1.89	1.3
1.19	0.14	1.1.2	0.16	2.01	» +1.4 1/2
0.29	0.49	»	0.17	2.05	1.4 1/2
0.19	0.84	»	0.12	2.37	»
0.15	1.27	»	—	3.19	»
0.11	1.75	» +1.3	—	4.07	»
0.27	1.71	» »	—	5.25	»
0.25	1.75	1.3	—	5.16	» + Tl_2SO_4
0.26	1.82	»	—	5.28	» »

1.1.2 = $La_2(SO_4)_3.Tl_2SO_4.2H_2O$; 1.3 = $La_2(SO_4)_3.3Tl_2SO_4$;
1.4 1/2 = $La_2(SO_4)_3.4\,1/2\,TlSO_4$.

LAURIC ACID $CH_3(CH_2)_{10}COOH$.

FREEZING-POINTS OF MIXTURES OF LAURIC ACID AND PALMITIC ACID [$CH_3(CH_2)_{14}CO\,OH$]. (Waentig and Pescheck, 1919.)

The reading for the melting point was taken when a slight rise and holding constant of the thermometer occurred during the gradual cooling of the well stirred mixture of the two fatty acids.

	Palmitic Acid in mixtur			Palmitic Acid in mixture			Palmitic Acid in mixture	
t°.	Wt. %.	Mol. %.	t°.	Wt. %.	Mol. %.	t°.	Wt. %.	Mol. %.
60.95...	100.0	100.0	48.70...	61.41	55.42	39.15...	42.02	36.15
59.48...	94.0	92.4	48.05...	59.96	53.92	38.03...	37.65	32.06
58.40...	89.87	87.39	47.28...	58.06	51.96	37.60...	34.97	29.58
57.16...	85.59	82.27	46.45...	56.31	50.17	37.12...	31.95	26.84
56.16...	82.04	78.11	45.57...	54.72	48.56	36.34...	28.39	23.65
55.22...	78.83	74.42	44.08...	52.16	46.00	35.50...	24.64	20.35
54.15...	75.66	70.83	43.53...	51.92	45.76	36.33...	20.32	16.61
53.12...	72.62	67.45	43.00...	51.45	45.29	36.90...	16.17	13.16
52.10...	69.91	64.48	42.78...	49.09	42.97	38.26...	10.87	8.70
51.26...	67.60	61.98	42.63...	47.83	41.72	40.55...	5.32	4.21
50.45...	65.40	59.63	41.70...	46.22	40.17	43.35...	0.00	0.00
49.45...	63.24	57.34	40.55...	44.32	38.34			

Tri LAURIN $C_3H_5(O.C_{12}H_{23}O)_3$.

100 gms. abs. alcohol dissolve 6.66 gms. Trilaurin at 20–25° } (Pucher and Dehn,
» Quinoline » 18.22 » » » } 1921.)
» equi mol. mixture of alcoho and Quinoline dissolve 16.57 gms. Trilaurin at 20-25°.

LEAD ACETATE $Pb(CH_3COO)_2.3H_2O_2$.

Solubility of Lead Acetate in Water. (Dundon and Henderson, 1922.)

The analysis of the saturated solutions was made by a method of « floating equilibrium ». To a known weight of saturated solution of unknown concentration, water was added untill the mixture attained the same density as a glass float calibrated at a definite arbitrary temperature. The saturated solutions were prepared by constant stirring in a thermostat and approaching equilibrium from 0°.5 to 3°.0 above the temperature desired. The solid was $Pb(CH_3CO\,O)_2.3\,H_2O$ in all cases.

t°.	d of sat. sol.	Gms. $Pb(CH_3COO)_2$ per 100 gms. H_2O.	Gms. $Pb(CH_3COO)_2$ per 100 gms. sat. sol.	t°.	d of sat. sol.	Gms. $Pb(CH_3COO)_2$ per 100 gms. H_2O.	Gms. $Pb(CH_3COO)_2$ per 100 gms. sat. sol.
0...	1.140	19.7	16.5	30...	1.41	69.7	41.1
5...	–	23.6	19.4	35...	1.48	88.9	47.1
10...	1.195	29.3	22.8	40...	1.60	116.0	53.7
15...	1.220	35.6	26.4	45...	1.73	153.0	60.7
20...	1.260	44.3	30.7	50...	1.88	221.0	67.6
25...	1.330	55.2	35.6				

Solubility of Lead Acetate in Aqueous Solutions of Acetic Acid. (Osaka and Hara, 1917.)

The saturated solutions were prepared by constant agitation for two days. The lead in the saturated solutions was determined as sulfate.

Normality of Aq. CH_3COOH.	Gms. $Pb(CH_3COO)_2$ per 100 gms. sat. sol. at 25°.	35°.	45°.
0.025	35.11	46.65	60.61
0.05	34.96	46.56	60.55
0.10	34.72	46.35	60.42

100 gms. glycerol of $d = 1.2326$ (= 86.5 %) dissolve 129.3 gms. $Pb(CH_3COO)_2$ at 20°
» of $d = 1.2645$ (= 98.5 %) » 143.0 » »
(Holm, 1921, 1921 *a*, 1922.)

LEAD salt (neutral) of racemic β Methyl ADIPIC ACID.

100 gms. sat. solution in water contain 0.35 gm. of the salt at 20°. (Meurisse.)

LEAD ARSENATE.

Solubility of Commercial Lead Arsenate in Aqueous Solutions of Salts. (Stewart, 1922.)

The sample of commercial lead arsenate was guaranteed to contain not less than 25 per cent of arsenic and not more than 1 1/2 per cent water soluble arsenic. The aqueous solutions containing an excess of the lead arsenate were shaken two or more times daily for three weeks or more at room temperature. One liter of each sat. solution was treated with 10 cc. of HNO_3 + 10 cc. of H_2SO_4 and evaporated to appearance of white fumes. The arsenic in the residue was determined by the modified Williamson method. Two concentrations of salt solutions were used, namely 0.01447 normal and 0.0723 normal. The solubility of the lead arsenate in distilled water was found to be 3.0 parts arsenic per million. In tap-water containing 212 parts of solids per million (mostly Ca and Mg bicarbonates) it was 33.8 parts arsenic per million.

Results for the Solubility of Lead Arsenate in 0.01447 Normal Salt Solutions.

Parts Arsenic dissolved per million parts of aqueous solution of

Salt of.	Carbonate.	Chloride.	Nitrate.	Bicarbonate.	Sulfate.	Bisulfate.	Secondary Phosphate.	Primary Phosphate.
K.....	165.2	39.3	4.5	139.9	4.6	241.9	174.2	29.1
Na.....	184.8	31.7	5.3	136.4	5.9	260.9	168.9	11.8
NH_4....	175.6	37.0	3.4	136.4	3.5	271.5	177.6	18.7
Ca.....	73.4	54.7	2.0	–	5.6	296.3	73.9	36.6
Mg....	4.1	36.6	3.5	37.4	4.5	268.5	93.5	21.0

SOLUBILITY OF COMMERCIAL LEAD ARSENATE IN AQUEOUS SOLUTIONS OF SALTS.
(Stewart, 1922.)

Results for the solubility in 0.0723 normal salt solutions.

Salt of	Parts Arsenic dissolved per million parts of aqueous solution of							
	Carbonate.	Chloride.	Nitrate.	Bicarbonate.	Sulfate.	Bisulfate.	Secondary Phosphate.	Primary Phosphate.
K	115.9	156.0	8.1	99.8	5.8	647.2	292.9	78.0
Na	131.8	130.5	13.5	96.7	5.7	1016.9	357.0	84.6
NH_4	119.2	–	5.4	162.5	–	838.3	392.1	63.0
Ca	36.5	105.4	4.3	13.5	4.2	615.2	57.7	67.5
Mg	20.1	101.2	3.5	85.4	2.6	572.3	46.1	38.0

Each result in the tables represent an average of 2 to 10 determinations.

Data are also given for the solubility of lead arsenate in soil solutions.

Data for equilibrium in the system lead oxide, arsenic trioxide and water at 25° are given by Story and Anderson, 1924.

Fusion point data for the systems $Pb_3(As O_4)_2 + Pb F_2$, $Pb_3(As O_4)_2 + Pb Cl_2$ and $Pb_3(As O_4)_2 + Pb O$ are given by Amadori, 1916-1917, 1919.

LEAD BENZOATE $Pb(C_6H_5COO)_2H_2O$.

SOLUBILITY IN WATER AND IN AQUEOUS SOLUTIONS AT 18°.
(Auerbach and Weber, 1925.)

Solvent.	Gms. $Pb(C_6H_5COO)_2$ per liter sat. sol.	Solvent.	Gms. $Pb(C_6H_5COO)$ per liter sat. sol.
Water	1.647	Aq. 1.0 *n* CH_3COONH_4	16.70
Aq. 0.01 *n* HCl	3.17	Aq. 50 % C_2H_5OH	1892.0
» 1.0 *n* CH_3COONa	14.18		

The sat. sol. in water had $p_H = 6.0$.

SOLUBILITY OF SEVERAL LEAD BENZOATES IN WATER AT 20°. (Ephraim and Pfister, 1925.)

Compound.	Formula.	Gms. anhydrous cmpd. per 100 cc. sat. sol.
Lead Benzoate	$Pb(C_6H_5COO)_2.H_2O$	0.179
» .4.Oxy benzoate	$Pb(C_6H_4OH.COO)_2.2H_2O$	0.470
» .4.Nitro benzoate	$Pb(C_6H_4.NO_2.COO)_2$	0.159
» .4.Chlor benzoate	$Pb(C_6H_4.Cl.COO_2)_2H_2O$	0.078
» .4.Methoxy benzoate	$Pb(C_6H_4.OCH_3.COO)_2H_2O$	0.0486

LEAD BROMIDE $PbBr_2$.

SOLUBILITY OF LEAD BROMIDE IN AQUEOUS SOLUTIONS OF SALTS AT 25°.
(Herz and Hellebrandt, 1923.)

Aq. salt solution.	Gm. mol. $PbBr_2$ per liter sat. sol.	Aq. salt solution.	Gm. mol. $PbBr_2$ per liter sat. sol.	Aq. salt solution.	Gm. mol. $PbBr_2$ per liter sat. sol.
H_2O alone	0.02625	0.73 *n* NaBr	0.00860	2.95 *n* $\frac{CaCl_2}{2}$	0.01357
0.48 *n* KCl	0.00556	1.47 »	0.02247	3.93 »	0.02355
0.97 »	0.00582	2.20 »	0.07043	0.52 *n* $\frac{CaBr_2}{2}$	0.00677
1.94 »	0.00620	2.93 »	0.1958	1.04 »	0.01205
2.91 »	0.01057	3.67 »	0.3936	2.08 »	0.04380
3.88 »	0.01505	4.40 »	0.7337	3.13 »	0.1175
0.79 *n* KBr	0.00725	0.52 *n* $\frac{BaCl_2}{2}$	0.00574	4.17 »	0.5187
1.58 »	0.00874	1.04 »	0.00765	0.66 *n* $\frac{SrCl_2}{2}$	0.00564
2.16 »	0.02650	2.08 »	0.02388	1.33 »	0.00627
3.23 »	0.08542	0.45 *n* $\frac{BaBr_2}{2}$	0.00607	2.66 »	0.01545
4.28 »	0.17900	0.91 »	0.01091	3.09 »	0.02000
0.47 *n* NaCl	0.00456	1.82 »	0.04443	4.18 »	0.02718
0.95 »	0.00561	2.76 »	0.1604	0.52 *n* $\frac{SrBr_2}{2}$	0.00673
1.89 »	0.00844	3.67 »	0.4140	1.04 »	0.01273
2.84 »	0.01466	0.49 *n* $\frac{CaCl_2}{2}$	0.00462	2.08 »	0.04367
3.79 »	0.03033	0.98 »	0.00544	3.12 »	0.1559
4.74 »	0.06144	1.97 »	0.00693	4.16 »	0.5687

SOLUBILITY OF LEAD BROMIDE IN AQUEOUS SOLUTIONS OF POTASSIUM BROMIDE AT 25° AND VICE VERSA. (Burrage, 1926.)

Gms. per 1000 gms. sat. sol.			Gms. per 1000 gms. sat. sol.		
KBr.	$PbBr_2$.	Solid Phase.	KBr.	$PbBr_2$.	Solid Phase.
0.0	9.69	$PbBr_2$	190.5	6.66	$KBr.2PbBr_2$
0.56	9.46	»	206.4	7.53	»
1.31	8.75	»	216.1	8.68	»
4.23	7.82	»	256.9	14.94	»
13.25	3.47	»	301.1	31.60	»+$KBr.PbBr.1/3H_2O$
22.92	2.56	»	319.7	36.22	$KBr.PbBr_2.1/3H_2O$
49.67	3.10	»+$KBr.2PbBr_2$	338.0	42.48	»
56.09	2.92	$KBr.2PbBr_2$	356.8	50.38	»
129.4	3.30	»	388.7	72.05	»+KBr
131.8	3.45	»	393.2	49.29	KBr
145.4	4.27	»	402.8	18.35	»
182.7	5.60	»	405.2	0.0	»

Data for the solubility of mixed crystals of lead bromide and lead chloride in water are given by Meyer, 1922, 1926.

Fusion point data for mixtures of lead bromide and silver bromide are given by Tubaudt and Eggert, 1920.

LEAD Sub BROMIDE PbBr.

1000 cc. sat. solution of lead subbromide in water contain 0.4 milliequivalents Pb Br at 25°, as determined by the conductivity method. (Denham, 1918.)

LEAD CARBONATE $PbCO_3$.

100 gms. of a sat. solution of lead carbonate in water at 18° and in contact with CO_2 at a pressure of 1 atmosphere, contain 0.014 gm. Pb CO_3. At a pressure of 56 atmospheres of CO_2, 0.015 gm. Pb CO_3 are dissolved. (Haehnel, 1924.)

SOLUBILITY OF LEAD CARBONATE AND OTHER LEAD SALTS IN BLOOD SERUM AT 25°. (Fairhall, 1924*a*.)

An excess of metallic lead or of the lead salt was added to 250 cc. bottles containing fresh horse serum preserved with a small amount of thymol. The bottles were rotated for 24 hours in a thermostat at 25°. The undissolved solid was thrown down by centrifugation and portions of the clear sat. solution were analyzed by evaporating, ashing, converting the lead to chromate and titrating with 0.005 *n* thiosulfate solution.

Lead compound employed.	Gms. lead cmpd. per liter of Serum at 25°.	Comparative solubility in Water.
Lead carbonate ($PbCO_3$)..	0.0333 (0.0125)	0.0017 at 18° as det. by Pleissner
» sulfate ($PbSO_4$)....	0.0437 (0.0300)	0.044 at 24°.95 as det. by Böttger
» chromate $PbCrO_4$..	— —	0.00001 at 25° as det. by von Hevesy
» oxide PbO.....	1.1520 (1.1600)	0.0171 at 20° as det. by Pleissner
» Pb.....	0.578 (0.193)	

The results in parentheses were obtained by saturating the fresh serum suspensions of the solid with CO_2 at 25°, and determining the solubility as above. The high value for Pb O is due to the formation of lead hydroxide, which is removed by protein with, which it combines to form an alkali metaprotein.

LEAD per CHLORATE $Pb(ClO_4)_2.3H_2O$.

100 gms. sat. solution of lead perchlorate trihydrate in water contain 81.472 gms. $Pb(ClO_4)_2$ at 25° and the density of the solution is $d_{\frac{25}{4}} = 2.7753$. (Willard and Kassner, 1926.)

LEAD CHLORIDE $PbCl_2$.

100 gms. sat. sol. of lead chloride in water contain 1.083 gms. $PbCl_2$ at 25°. (Burrage, 1926; Herz and Hellebrandt, 1923.)

100 gms. sat. sol. in water contain 0.85 (aver.) gm. $PbCl_2$ at 15°, 1.75 gm. at 50° and 3.10 gms. at 100°. (Demassieux, 1923.)

Solubility of Lead Chloride in Aqueous Solutions of Acetic Acid at 25°. (Herz and Martin, 1924.)

Titrametric Conc. of CH_3COOH.	Mols. Pb per liter.	Titrametric Conc. of CH_3COOH.	Mols. Pb per liter.	Titrametric Conc. of CH_3COOH.	Mols. Pb per liter.
0.0	0.03895	5.16	0.01446	10.17	0.00363
1.02	0.03365	5.87	0.01163	11.24	0.00258
2.05	0.02796	7.06	0.00887	12.20	0.00191
3.04	0.02266	7.93	0.00660	13.28	0.00136
3.94	0.01837	8.94	0.00505	14.44	0.00123
				14.90	0.00120

Solubility of Lead Chloride in Aqueous Solutions of Ammonium Chloride. (Demassieux, 1923.)

Results at 17°. Gms. per 100 gms. sat. sol.		Results at 50°. Gms. per 100 gms. sat. sol.		Results at 100°. Gms. per 100 gms. sat. sol.		Solid Phase at each temp.
$PbCl_2$.	NH_4Cl.	$PbCl_2$.	NH_4Cl.	$PbCl_2$.	NH_4Cl.	
0.89	0.0	1.09	0.50	3.10	0.0	$PbCl_2$
0.21	0.96	0.67	1.51	2.0	1.31	»
0.14	2.40	0.50	3.85	1.75	5.47	»
0.07	4.19	0.54	4.28	1.76	6.01	»
0.08	4.31	0.58	4.45	1.78	8.62	» +1.2
0.07	4.98	0.49	4.84	1.73	9.66	1.2
0.09	12.30	0.39	7.27	2.90	19.77	»
0.34	22.34	0.72	19.42	4.50	26.00	»
–	–	1.76	27.15	8.40	34.63	»
		3.29	31.25	11.40	36.29	»
				12.67	37.38	» +1.2
–	–			12.51	37.92	1.2
				10.68	38.82	»
–	–	–	–	9.53	41.90	» $+NH_4Cl$
0.64	26.49	3.96	33.55			2.1 $+NH_4Cl$
0.33	27.23	1.60	33.90	4.21	42.96	NH_4Cl
0.0	27.35	0.32	34.14	3.06	43.40	»
–	–	0.0	34.25	0.71	43.88	»

2.1 = $2PbCl_2.NH_4Cl$; 1.2 = $PbCl_2.2NH_4Cl$.

Solubility of Lead Chloride in Aqueous Solutions of Ammonium Chloride at 25°. (Kendall and Sloan, 1925.)

Gm. equiv. per liter		Gm. equiv. per liter		Gm. equiv. per liter		Gm. equiv. per liter	
$[NH_4Cl]$.	$[PbCl_2]$.	$[NH_4Cl]$.	$[PbCl_2]$.	$[NH_4Cl]$.	$PbCl_2$.	$[NH_4Cl]$.	$[PbCl_2]$.
0.20	0.02207	1.96	0.00923	4.22	0.02220	5.46	0.03645
0.50	0.01305	2.57	0.01142	4.64	0.02620	5.66	0.04000
0.56	0.01224	3.18	0.01462	4.83	0.02836	6.00	0.04723
0.80	0.00878	3.47	0.01643	5.00	0.03030	6.28	0.05507
1.00	0.00765	3.60	0.01721	5.09	0.03142	6.30	0.05601
1.20	0.00769	3.90	0.01982	5.20	0.03264		

The solid phase at all concentrations above 0.6 n is 2 $PbCl_2.NH_4Cl$.

Solubility of Lead Chloride in Aqueous Solutions of Barium Bromide at 25°. (Herz and Hellebrandt, 1923).

Normality of $\frac{BaBr_2}{2}$	0.45.	0.91.	1.83.	2.70.	3.67.
Mols. Pb per liter	0.00603	0.01096	0.03858	0.1267	0.2960

Solubility of Lead Chloride in Aqueous Solutions of Barium Chloride at 25°.

Results of Herz and Hellebrandt, 1923.		Results of Kendall and Sloan, 1925.					
Normality of $\frac{BaCl_2}{2}$.	Mols Pb per liter.	Gm. equiv. per liter.		Gm. equiv. per liter.		Gm. equiv. per liter.	
		$[BaCl_2]$.	$[PbCl_2]$.	$[BaCl_2]$.	$[PbCl_2]$.	$[BaCl_2]$.	$[PbCl_2]$.
0.32	0.00699	0.10	0.02322	1.54	0.02820	2.56	0.04600
0.64	0.00553	0.20	0.02000	1.86	0.03275	2.76	0.05135
1.38	0.01089	0.50	0.01966	2.02	0.03524	2.90	0.05598
2.08	0.02388	0.96	0.02180	2.10	0.03662	2.98	0.05922
		1.09	0.02322	2.30	0.04030	3.12	0.06600
		1.35	0.02600	2.45	0.04361	3.26	0.07362

Solid Phase $BaCl_2.PbCl_2$ in all cases.

Solubility of Lead Chloride in Aqueous Solutions of Calcium Bromide at 25°. (Herz and Hellebrandt, 1923.)

Normality of $\frac{CaBr_2}{2}$.....	0.47.	0.95.	1.91.	2.85.	3.81.
Mols Pb per liter.....	0.00681	0.01065	0.03787	0.09418	0.2173

Solubility of Lead Chloride in Aqueous Solutions of Calcium Chloride at 25°.

Results of Herz and Hellebrandt, 1923.		Results of Kendall and Sloan, 1925.					
Normality of $\frac{CaCl_2}{2}$.	Mols. Pb per liter.	Gm. equiv. per liter.		Gm. equiv. per liter.		Gm. equiv. per liter.	
		$[CaCl_2]$.	$[PbCl_2]$.	$[CaCl_2]$.	$[PbCl_2]$.	$[CaCl_2]$.	$[PbCl_2]$.
0.52	0.00696	0.20	0.02402	2.10	0.02480	4.60	0.04260
0.95	0.00563	0.50	0.02144	2.19	0.02522	5.02	0.04903
1.91	0.00771	0.70	0.02100	2.38	0.02601	5.18	0.05202
3.03	0.01268	0.94	0.02122	2.80	0.02807	5.27	0.05400
4.12	0.02057	1.18	0.02106	3.44	0.03227	5.43	0.05831
		1.52	0.02208	3.63	0.03660	5.62	0.06500
		1.84	0.02350	4.06	0.03655	5.68	0.06821

Solid Phase $CaCl_2.PbCl_2.6H_2O$ in all cases.

Solubility of Lead Chloride in Aqueous Solutions of Hydrochloric Acid at 25°. (Kendall and Sloan, 1925.)

Gm. equiv. per liter.		Gm. equiv. per liter.		Gm. equiv. per liter.		Gm. equiv. per liter.	
[HCl].	$[PbCl_2]$.	[HCl].	$[PbCl_2]$.	[HCl].	$[PbCl_2]$.	[HCl].	$[PbCl_2]$.
0.20	0.01320	1.72	0.01014	2.90	0.01180	4.70	0.01812
0.30	0.01180	1.86	0.01023	3.25	0.01247	5.16	0.02161
0.50	0.01020	2.04	0.01042	3.52	0.01330	5.50	0.02500
0.08	0.00984	2.09	0.01060	3.58	0.01340	5.60	0.02611
1.00	0.00981	2.57	0.01126	4.02	0.01495	5.78	0.02802
1.30	0.00985			4.30	0.01604		

Solubility of Lead Chloride in Aqueous Solutions of Lithium Chloride at 25°. (Kendall and Sloan, 1925.)

Gm. equiv. per liter.		Gm. equiv. per liter.	
[LiCl].	$[PbCl_2]$.	[LiCl].	$[PbCl_2]$.
0.28	0.02565	2.10	0.04300
0.32	0.02500	2.26	0.04729
0.52	0.02384	2.40	0.05144
0.74	0.02449	2.58	0.05723
0.91	0.02582	2.68	0.06086
1.28	0.02945	2.72	0.06317
1.55	0.03306	2.75	0.06507
1.81	0.03720	2.82	0.06930

at 50°. (Demassieux, 1923.)

Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
LiCl.	$PbCl_2$.	LiCl.	$PbCl_2$.
2.06	0.45	37.51	7.53
4.79	0.35	38.52	7.55
5.07	0.37	39.40	7.62
9.59	0.49	40.50	7.45
16.10	0.83	43.99	7.42
24.64	2.31	45.51	6.66
30.61	5.08	46.22	6.50
35.05	6.80	47.72	3.39
36.69	7.46	48.41	2.22

Solid Phase, $LiCl.2PbCl_2$ in all cases. A double salt was not found.

Solubility of Lead Chloride in Aqueous Solutions of Magnesium Chloride at 25°. (Kendall and Sloan, 1925.)

Gm. equiv. per liter		Gm. equiv. per liter		Gm. equiv. per liter		Gm. equiv. per liter	
$[MgCl_2]$.	$[PbCl_2]$.	$[MgCl_2]$.	$[PbCl_2]$.	$[MgCl_2]$.	$[PbCl_2]$.	$[MgCl_2]$.	$[PbCl_2]$.
0.12	0.01084	1.83	0.00723	4.86	0.01832	7.08	0.04844
0.27	0.00802	2.62	0.00915	5.42	0.02303	7.58	0.05944
0.60	0.00625	3.54	0.01205	5.94	0.02902	7.98	0.07000
0.85	0.00618	3.87	0.01329	6.36	0.03489	8.12	0.07360
1.58	0.00689	4.36	0.01564	6.78	0.04251		

Solid Phase $MgCl_2.PbCl_2.6H_2O$ in all cases.

Solubility of Lead Chloride in Aqueous Solutions of Mercuric Chloride at 25°. (Kendall and Sloan, 1925.)

Gm. equiv. per liter		Solid Phase.
$[HgCl_2]$.	$[PbCl_2]$.	
0.06	0.0885	$HgCl_2.PbCl_2$
0.10	0.0983	»
0.15	0.1074	»
0.50	0.1384	»

Solubility of Lead Chloride in Aqueous Solutions of Potassium Bromide at 25°. (Herz and Hellebrandt, 1923.)

Normality of KBr.....	0.53	1.07	2.14	3.21	4.28
Mols. Pb per liter.....	0.60789	0.00888	0.02577	0.06705	0.1774

Solubility of Lead Chloride in Aqueous Solutions of Potassium Chloride at 25°. (Burrage, 1926.)

Constant agitation in a thermostat was employed and great care exercised to insure that equilibrium had been attained. The solid phases were analyzed by the « rest method ».

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
K Cl.	$PbCl_2$.	Solid Phase.	K Cl.	$PbCl_2$.	Solid Phase.
0.0	1.083	$PbCl_2$	7.048	0.128	$KCl.2PbCl_2$
0.037	1.008	»	9.787	0.127	»
0.075	0.961	»	12.93	0.142	»
0.152	0.877	»	18.74	0.236	»+$KCl.PbCl_2.1/3H_2O$
0.296	0.747	»	22.54	0.303	$KCl.PbCl_2.1/3H_2O$
0.735	0.462	»	26.43	0.386	»+KCl
1.469	0.301	»	26.52	0.267	KCl
3.022	0.205	»	26.44	0.122	»
4.969	0.227	» + $KCl.2PbCl_2$	26.53	0.00	»

Solubility of Lead Chloride in Aqueous Solutions of Potassium Chloride at 25°. (Kendall and Sloan, 1925.)

Gms. equiv. per liter			Gms. equiv. per liter			Gms. equiv. per liter		
$[KCl]$.	$[PbCl_2]$.	Solid Phase.	$[KCl]$.	$[PbCl_2]$.	Solid Phase.	$[KCl]$.	$[PbCl_2]$.	Solid Phase.
0.25	0.01850	$PbCl_2$	0.78	0.01063	1.2	2.07	0.01287	1.2
0.37	0.01600	»	0.97	0.00981	»	2.17	0.01388	»
0.46	0.01422	»	1.10	0.00960	»	2.26	0.01489	1.1
0.52	0.01362	»	1.20	0.00960	»	2.41	0.01480	»
0.54	0.01354	»	1.30	0.00965	»	2.65	0.01601	»
0.63	0.01277	1.2	1.55	0.01025	»	2.98	0.01943	»
0.74	0.01102	»	1.80	0.01134	»	3.00	0.01966	»
					»	3.20	0.02402	»

1.2 = $KCl.2PbCl_2$; 1.1 = $KCl.PbCl_2$.

SOLUBILITY OF LEAD CHLORIDE IN AQUEOUS SOLUTIONS OF POTASSIUM CHLORIDE.
(Demassieux, 1923.)

Results at 14°. Gms. per 100 gms. sat. sol.		Results at 50°. Gms. per 100 gms. sat. sol.		Results at 100°. Gms. per 100 gms. sat. sol.		
K Cl.	$PbCl_2$.	K Cl.	$PbCl_2$.	K Cl.	$PbCl_2$.	Solid Phase at each temp.
0.0	0.91	0.0	1.75	0.0	3.10	$PbCl_2$
1.37	0.18	2.0	0.65	2.0	2.00	»
2.44	0.14	4.0	0.5	4.0	1.75	»
3.43	0.13	6.0	0.57	6.0	1.78	»
–	–	–	–	8.0	2.00	»
–	–	–	–	10.0	2.38	»
3.79	0.15	6.4	0.62	10.6	2.57	» + 2.1
4.0	0.13	12.0	0.50	12.0	2.42	2.1
4.7	0.08	14.0	0.52	14.0	2.32	»
12.75	0.08	16.0	0.55	16.0	2.35	»
15.65	0.10	18.0	0.62	18.0	2.50	»
15.87	0.11	20.0	0.70	20.0	2.75	»
16.26	0.11	22.0	0.85	22.0	3.10	»
–	–	–	–	24.0	3.50	»
–	–	–	–	26.0	4.25	»
16.83	0.12	22.8	0.97	27.2	5.00	» + 1.1.1/3
17.57	0.13	28.0	1.10	28.0	4.90	1.1.1/3
18 64	0.14	30.0	1.27	30.0	5.10	»
18.97	0.15	–	–	32.0	5.45	»
22.45	0.17	–	–	34.0	5.80	»
24.61	0.20	31.24	1.5	35.3	6.05	» + K Cl
–	–	31.0	1.0	35.0	3.5	K Cl
–	–	31.0	0.5	35.2	1.25	»
24.52	0.0	31.07	0.0	35.5	0.0	»

$2.1 = 2\,PbCl_2.KCl$; $1.1.1/3 = PbCl_2.KCl.1/3\,H_2O$.

The author's numerous determinations were plotted and the above values read from the average curve.

SOLUBILITY OF LEAD CHLORIDE IN AQUEOUS SOLUTIONS OF SODIUM BROMIDE AT 25°. (Herz and Hellebrandt, 1923.)

Normality of NaBr.....	0.48	0.97	1.94	2.82	3.78
Mol. Pb per liter.....	0.00697	0.01210	0.05932	0.14310	0.31855

SOLUBILITY OF LEAD CHLORIDE IN AQUEOUS SOLUTIONS OF SODIUM CHLORIDE AT 25°.

Results of Herz and Hellebrandt, 1923.		Results of Kendall and Sloan, 1923.				
Normality of Na Cl.	Mol. Pb per liter.	Gm. equiv. per liter [Na Cl].	Gm. equiv. per liter [$PbCl_2$].	Gm. equiv. per liter [Na Cl].	Gm. equiv. per liter [$PbCl_2$].	Gm. equiv. per liter [Na Cl].	Gm. equiv. per liter [$PbCl_2$].
0.0	0.03895	0.25	0.01603	1.56	0.01468	3.06	0.03188
0.51	0.00648	0.40	0.01370	1.85	0.01725	3.29	0.03545
1.02	0.00631	0.50	0.01300	1.96	0.01807	3.54	0.03966
2.05	0.00961	0.70	0.01192	2.25	0.02100	3.78	0.04497
3.03	0.01279	0.86	0.01205	2.46	0.02370	4.04	0.05008
4.10	0.04377	1.14	0.01261	2.66	0.02606	4.18	0.05431
		1.46	0.01403	2.90	0.02944	4.39	0.06302
		Solid phase above 0.5 *n* Na Cl is $2\,NaCl.2\,PbCl_2$.				4.50	0.07009

SOLUBILITY OF LEAD CHLORIDE IN AQUEOUS SOLUTIONS OF SODIUM CHLORIDE
(Demassieux, 1922.)

Results at 13°. Gms. per 100 gms. sat. sol.		Results at 50°. Gms. per 100 gms. sat. sol.		Results at 100°. Gms. per 100 gms. sat. sol.		
Na Cl.	$PbCl_2$.	Na Cl.	$PbCl_2$.	Na Cl.	$PbCl_2$.	Solid Phase at each temp.
0.0	0.82	2.07	0.57	2.01	1.65	$PbCl_2$
1.0	0.18	5.36	0.38	5.00	1.53	»
4.97	0.09	9.57	0.58	13.12	2.54	»
13.39	0.19	17.22	1.20	19.55	4.95	»
16.46	0.31	22.94	2.41	24.01	9.00	»
23.46	1.10	25.51	4.04	25.21	10.47	»
26.17	1.88	26.46	4.94	26.27	11.92	» + Na Cl
26.29	0.75	26.48	3.88	27.05	6.86	Na Cl
26.33	0.0	26.89	1.50	27.09	2.82	»

SOLUBILITY OF LEAD CHLORIDE IN AQUEOUS SOLUTIONS OF STRONTIUM BROMIDE AT 25°. (Herz and Hellebrandt, 1923.)

Normality of $\frac{SrBr_2}{2}$	0.52	1.04	2.08	3.12	4.16
Mol. Pb per liter	0.00629	0.01139	0.04875	0.1397	0.3993

SOLUBILITY OF LEAD CHLORIDE IN AQUEOUS SOLUTIONS OF STRONTIUM CHLORIDE AT 25°.

Results of Herz and Hellebrandt, 1923.		Results of Kendall and Sloan, 1925.				
Normality of $\frac{SrCl_2}{2}$,	Mol. Pb. per liter.	Gm. equiv. per liter		Gm. equiv. per liter		Gm. equiv. per liter.
		$[SrCl_2]$.	$[PbCl_2]$.	$[SrCl_2]$.	$[PbCl_2]$.	$[SrCl_2]$. $[PbCl_2]$.
0.51	0.00678	0.20	0.02633	1.70	0.02985	2.96 0.04304
1.02	0.00640	0.32	0.02502	2.06	0.03260	3.32 0.05032
1.38	0.00824	0.60	0.02480	2.12	0.03303	3.36 0.05118
2.66	0.01418	0.80	0.02522	2.55	0.03705	3.47 0.05440
3.09	0.01578	1.12	0.02620	2.66	0.03869	3.64 0.06009
4.13	0.02698	1.46	0.02821	2.80	0.04027	3.78 0.06502
		Solid Phase $SrCl_2.PbCl_2$ in all cases.				3.88 0.06940

Fusion-point data are given for the following systems :

$PbCl_2 + Pb_3(PO_4)_2$ (Amadori, 1918, 1919.)
$PbCl_2 + Pb_3(VO_4)_2$ (Amadori, 1919.)
$PbCl_2 + AgCl$ (Tubaudt and Eggert, 1920.)
$PbCl_2 + NaCl$ (Demassieux, 1923.)

LEAD Sub CHLORIDE PbCl.

1000 cc. sat. solution of lead subchloride in water contain 2.2 milli equivalents PbCl at 25° as determined by the conductivity method. (Denham, 1918.)

LEAD CHROMATE $PbCrO_4$.

SOLUBILITY OF LEAD CHROMATE IN AQUEOUS SOLUTIONS OF PERCHLORIC ACID AND OF MIXTURES OF PERCHLORIC ACID AND LEAD PERCHLORATE AT 25°. (Willard and Kassner, 1926.)

Solvent mols. per liter			Dissolved $PbCrO_4$		Solvent mols. per liter			Dissolved $PbCrO_4$	
$HClO_4$.		$PbClO_4$.	Gms. per 100 cc.	Millimols. per 100 cc.	$HClO_4$.		$PbClO_4$.	Gms. per 100 cc.	Millimols. per 100 cc.
0.1	+	0.0	0.0041	0.0127	5.0	+	0.0	0.0191	0.0591
0.5	+	0.0	0.0120	0.0371	0.5	+	0.005	0.0005	0.0015
1.0	+	0.0	0.0140	0.0433	1.0	+	0.005	0.0013	0.0040
2.0	+	0.0	0.0199	0.0616	2.0	+	0.010	0.0012	0.0037
3.0	+	0.0	0.0211	0.0668	2.0	+	0.015	0.0006	0.0019
4.0	+	0.0	0.0213	0.0659	5.0	+	0.020	0.0001	0.0003

SOLUBILITY OF LEAD CHROMATE IN AQUEOUS SOLUTIONS OF NITRIC ACID AND OF MIXTURES OF NITRIC ACID AND LEAD NITRATE AT 25°.

(Willard and Kassner, 1926.)

Mols. per liter solvent			Dissolved $PbCrO_4$		Mols. per liter solvent			Dissolved $PbCrO_4$	
HNO_3.		$Pb(NO_3)_2$.	Gms. per 100 cc.	Millimols. per 100 cc.	HNO_3.		$Pb(NO_3)_2$.	Gms. per 100 cc.	Millimols. per 100 cc.
0.1	+	0.0	0.0063	0.0195	0.1	+	0.005	0.0001	0.0003
0.5	+	0.0	0.0177	0.0548	0.5	+	0.005	0.0018	0.0055
1.0	+	0.0	0.0385	0.1190	1.0	+	0.010	0.0038	0.0117
2.0	+	0.0	0.0889	0.2752	3.0	+	0.020	0.0381	0.1179
3.0	+	0.0	0.1701	0.5265	2.0	+	0.15	0.0012	0.0037
4.0	+	0.0	0.2810	0.8700	2.0	+	0.25	0.0002	0.0006
5.0	+	0.0	0.4367	1.3510	2.0	+	0.3*	0.0002	0.0006

* $Na_2Cr_2O_7$ instead of $Pb(NO_3)_2$.

The solubility of lead chromate in perchloric acid increases up to a molar concentration of the acid of about 4.0 and then begins to decrease, while in nitric acid the solubility continues to increase with increasing concentration of acid. It is also noted that lead chromate is much less soluble in perchloric than in nitric acid of the same concentration.

Fusion point data for mixtures of lead chromate and lead sulfate, lead chromate and lead molybdate, and lead chromate and lead tungstate are given by Jaeger and Germs, 1921.

LEAD CINNAMATE $Pb.C_{18}H_{14}O_4.2H_2O$.

100 gms. sat. solution of lead cinnamate in water contain 0.141 gm. $Pb.C_{18}H_{14}O_4$ at 20°. (Ephraim and Pfister, 1925.)

LEAD CITRATE $Pb_3(C_6H_5O_7)_2.H_2O$.

SOLUBILITY OF LEAD CITRATE IN WATER AND IN AQUEOUS SOLUTIONS AT 18°

(Auerbach and Weber, 1925.)

Solvent.	Gms. $Pb_3(C_6H_5O_7)_2$ per liter sat. sol.
Water	0.159 (p_H of sat. sol. = 6.3)
Aq. 0.01 *n* HCl	1.466
» 0.10 *n* HCl	8.28
» 1.00 *n* CH_3COONa	6.70
» 1.00 *n* CH_3COONH_4	6.83
» 50 wt. % C_2H_5OH	14.00

LEAD ERUCATE $Pb[C_8H_{17}CH:CH(CH_2)_{11}COO]_2$.

100 gms. anhydrous ethyl ether dissolve 0.408 gms. lead erucate at 25°. The presence of moisture affects this solubility greatly. (Thomas and Mattikow, 1926.)

LEAD FLUORIDE PbF_2.

Fusion point data for mixtures of $PbF_2 + Pb_3(PO_4)_2$ are given by Amadori, 1918, 1919, and for $PbF_2 + Pb_3(VO_4)_2$ by Amadori, 1919.

LEAD Tri Potassium Hydrogen Octa **FLUORIDE**. $3KF.HF.PbF_4$.

LEAD Di Sodium Hexa **FLUORIDE** $2NaF.PbF_4$.

Data for the solubility of these two salts in water and in aqueous solutions of H_2F_2 at 25° are given by Clark, 1919.

SOLUBILITY OF TRIMETHYL, TRIETHYL, ETC. LEAD FLUORIDES IN SEVERAL SOLVENTS.
(Krause and Pohland, 1922.)

Compound.	Formula.	t°.	Gms. cmpd. per 100 gms. of H_2O.	CH_3OH.	C_2H_5OH.	C_6H_6.
Tri methyl lead fluoride...	$(CH_3)_3PbF$	30	5.51	8.24	6.89	0.028
» » ...	»	50	26.3	99.5	82.0	0.87
Tri ethyl » ...	$(C_2H_5)_3PbF$	30	1.3	7.24	6.11	0.185
» » ...	»	50	7.04	90.0	75.1	0.60
Tri *n* propyl » ...	$(nC_3H_7)_3PbF$	30.1	0.17	2.01	1.21	0.055
» » ...	»	50	0.23	4.94	3.53	0.082
Tri *iso* butyl » ...	$(iC_4H_9)_3PbF$	30	0.12	1.76	1.09	0.042
» » ...	»	50	0.18	2.96	2.13	0.071
Tri *iso* amyl » ...	$(iC_5H_{11})_3PbF$	30.1	0.019	2.34	1.73	0.063
» » ...	»	50	0.022	6.32	4.55	0.004
Tri phenyl » ...	$(C_6H_5)_3PbF$	30	0.031	0.36	0.15	0.080
» » ...	»	50	0.10	1.45	0.24	0.092
Tri cyclo hexyl » ...	$(C_6H_{11})_3PbF$	30	0.096	0.66	0.39	0.11

Tri cyclo Hexyl **LEAD** $(C_6H_{11})_3Pb$.

100 gms. C_2H_5OH dissolve 0.076 gm. $(C_6H_{11})_3Pb$ at 30° (Krause and Reiszaus, 1921.)
» C_6H_6 » 2.28 » »
» $CHCl_3$ » 1.27 » »

LEAD FUMARATE $PbC_4H_2O_4$.

100 gms. H_2O dissolve 0.025 gm. $Pb(C_4H_2O_4)$ at 30°. (Weiss and Downs, 1923.)

LEAD HELIANTHATE $Pb(C_{14}H_{14}N_3SO_3)_2.4H_2O$.

1000 cc. H_2O dsisolve 0.111 gm. lead helianthate (= 0.08 gm. helianthine) at 20°–25°. (Stark and Dehn, 1918.)

LEAD Nitroso phenyl **HYDROXYLAMINE**.

100 gms. H_2O dissolve $1.2.10^{-4}$ gm. of the compound at 18°. (Martin.)

LEAD IODIDE PbI_2.

SOLUBILITY OF LEAD IODIDE IN WATER.

t°.	Gm. PbI_2 per 100 gms. sat. sol.	Authority.
13.....	0.05	Demassieux, 1923
20.....	0.06	»
25.....	0.0758	Burrage, 1926
50.....	0.17	Demassieux, 1923

SOLUBILITY OF LEAD IODIDE IN AQUEOUS SOLUTIONS OF AMMONIUM IODIDE.
(Demassieux, 1923.)

Results at 20°. Gms. per 100 gms. sat. sol.			Results at 50°. Gms. per 100 gms. sat. sol.		
NH_4I.	PbI_2.	Solid Phase.	NH_4I.	PbI_2.	Solid Phase.
3.54	0.029	PbI_2	6.13	0.14	PbI_2
6.06	0.03	»	9.91	0.15	»
7.02	0.10	»+$PbI_2.NH_4I.2H_2O$	13.47	0.29	»+$PbI_2.NH_4I.2H_2O$
14.50	0.20	$PbI_2.NH_4I.2H_2O$	18.07	0.34	$PbI_2.NH_4I.2H_2O$
33.34	0.30	»	24.08	0.50	»
45.80	0.92	»	45.87	3.49	»
51.66	1.63	»	54.79	8.51	»
56.71	2.96	»	61.35	16.06	» + NH_4I
61.10	4.90	» + NH_4I	61.95	9.88	NH_4I
61.50	2.10	NH_4I	63.98	6.24	»
61.72	0.0	»	66.46	0.0	»

SOLUBILITY OF LEAD IODIDE IN AQUEOUS SOLUTIONS OF POTASSIUM IODIDE.

Results at 13°. (Demassieux, 1923.) Gms. per 100 gms. sat. sol.		Results at 25°. (Burrage, 1926.) Gms. per 100 gms. sat. sol.		Results at 50°. (Demassieux, 1923.) Gms. per 100 gms. sat. sol.		
KI.	PbI_2.	KI.	PbI_2.	KI.	PbI_2.	Solid Phase.
0.0	0.05	0.083	0.0234	2.84	0.002	PbI_2
2.21	0.001	0.166	0.0092	9.33	0.02	»
4.18	0.001	0.332	0.0040	14.48	0.02	»
9.09	0.002	0.664	0.0020	17.36	0.12	»
–	–	0.830	0.0019	18.77	0.14	»
–	–	1.661	0.0016	19.50	0.15	»
–	–	3.320	0.0020	21.00	0.27	»
–	–	8.307	0.0073	29.43	1.74	»
–	–	13.61	0.0316	29.51	1.82	»
–	–	14.90	0.0578	30.47	2.45	»
–	–	19.45	0.253	30.57	2.52	»
16.02	0.05	21.32	0.428	31.77	3.11	» + $PbI_2.KI.2H_2O$
17.26	0.02	26.82	0.553	32.12	3.10	$PbI_2.KI.2H_2O$
21.32	0.19	36.73	1.221	36.18	3.99	»
34.45	0.68	43.80	2.249	38.44	4.23	»
37.25	0.77	49.43	3.712	42.28	5.64	»
45.17	1.47	51.61	4.654	51.93	9.59	»
52.14	2.91	54.60	5.876	53.96	11.74	»
56.55	4.54	56.59	7.421	56.41	14.14	» + KI
57.66	0.0	57.82	5.235	58.49	9.72	KI
		59.13	5.49	60.28	5.55	»
		59.72	0.00	61.98	1.52	»
				62.02	1.48	»
				62.39	0.0	»

In the case of the determinations by Burrage, constant agitation in a thermostat was employed. At low concentration of PbI_2 the lead was determined colorimetrically. For the determinations by Demassieux the solutions were simply shaken by hand several times a day and the temperature held constant to within 0°.5.

SOLUBILITY OF LEAD IODIDE IN AQUEOUS SOLUTIONS OF SODIUM CHLORIDE AT 25°
(Burrage, 1926.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
NaCl.	PbI_2.	Solid Phase.	NaCl.	PbI_2.	Solid Phase.
0.00	0.0758	PbI_2	0.234	0.110	PbI_2
0.029	0.0778	»	0.586	0.141	»
0.059	0.0859	»	1.170	0.164	»
0.116	0.0951	»	2.980	0.179	»

Fusion-point data for mixtures of $PbI_2 + HgI_2$ are given by Losana, 1926. Results for mixtures of $PbI_2 + AgI$ are given by Tubaudt and Eggert, 1920.

LEAD Sub **IODIDE** PbI.

1000 cc. sat. solution of lead sub iodide in water contain 0.35 milliequivalents Pb I at 25° as determined by the conductivity method. (Denham, 1918.

LEAD MALATE (*i*) $Pb(C_4H_4O_5).{}^1/_2H_2O$.

100 cc. sat. solution of lead malate in water contain 0.0902 gm. Pb $(C_4H_4O_5)$ at 18° and the solution has $p_H = 5.9$. (Auerbach and Weber, 1925.)

100 gms. H_2O dissolve 0.21 gm. *i* lead malate at 30°. (Weiss and Downs, 1923.)

LEAD LIGNOCERATE.

100 gms. anhydrous ether dissolve 0.025 gm. lead lignocerate at 25°.
(Thomas and Yu, 1923.

Solubility of Lead Malate in Aqueous Solutions at 18°.
(Auerbach and Weber, 1925.)

Aqueous solution.	Gms. Pb ($C_4H_4O_5$) per liter of sat. sol.	Aqueous solution.	Gms. Pb ($C_4H_4O_5$) per liter of sat. sol.
0.01 *n* HCl	2.205	4.0 *n* CH_3COONa	171.2
0.10 *n* HCl	16.05	4.0 *n* CH_3COONH_4	300.6
1.0 *n* CH_3COONa	23.52	50 wt. per cent C_2H_5OH	26.0
1.0 *n* CH_3COONH_4	36.3		

Solubility of Active and Racemic Lead Malates in Water.
(Duboux and Cuttat, 1921.)

Results for Active Lead Malate.

t°.	Gms. Pb ($C_4H_4O_5$) per 100 gms. sat. sol.	Solid Phase.
0	0.015	$Pb(C_4H_4O_5).2H_2O$
12.5	0.027	»
25.0	0.052	»
37.5	0.089	»

Results for Racemic Lead Malate.

t°.	Gms. $Pb_2C_8H_8O_{10}$ per 100 gms. sat. sol.	Solid Phase.
0	0.015	$Pb_2C_8H_8O_{10}.2H_2O$
12.5	0.023	»
25	0.035	»
37.5	0.0545	»

LEAD MALEATE $PbC_4H_2O_4$.

100 gms. H_2O dissolve 0.052 gms. $PbC_4H_2O_4$ at 30°. (Weiss and Downs, 1923.)

LEAD MOLYBDATE $PbMoO_4$.

Solubility of Lead Molybdate in Aqueous Solutions of Perchloric Acid and of Mixtures of Perchloric Acid and Salts at 25°.
(Willard and Kassner, 1926.)

Composition of solvent in mols. per liter.	Dissolved $PbMoO_4$: Gms. per 100 cc.	Millimols. per 100 cc.
0.01 mol. $HClO_4$	0.0016	0.0043
0.5 » »	0.0136	0.0370
1.0 » »	0.0373	0.1016
2.0 » »	0.1176	0.3204
3.0 » »	0.2436	0.6639
0.01 » » + 0.01 mol. $Pb(ClO_4)_2$	0.0002	0.0005
0.5 » » + 0.01 » »	0.0005	0.0013
0.5 » » + 0.05 » »	0.0004	0.0011
0.5 » » + 0.10 » »	0.00006 (1)	0.0001 (1)
0.5 » » + 0.20 » »	0.00004 (1)	0.0001 (1)
0.5 » » + 0.02 » Na_2MoO_4	0.0004 (2)	0.0011 (2)
0.5 » » + 0.05 » »	0.00027 (2)	0.0007 (2)

Above 3.0 mol. $HClO_4$, $PbMoO_4$ decomposes to form solid MoO_3.

Solubility of Lead Molybdate in Aqueous Solutions of Nitric Acid and of Mixtures of Nitric Acid and Salts at 25°.
(Willard and Kassner, 1926.)

Composition of solvent in mols. per liter.	Dissolved $PbMoO_4$: Gms. per 100 cc.	Millimols. per 100 cc.
0.1 mol. HNO_3	0.0020	0.0060
0.5 » »	0.0244	0.0665
1.0 » »	0.1086	0.2958
0.5 » » + 0.1 mol. $Pb(NO_3)_2$	0.00032 (1)	0.0009 (1)
0.5 » » + 0.2 » »	0.0002 (1)	0.0005 (1)
0.5 » » + 0.02 » Na_2MoO_4	0.00064 (2)	0.0017 (2)
0.5 » » + 0.05 » »	0.0007 (2)	0.0019 (2)

Above 1.0 mol. HNO_3, $PbMoO_4$ decomposes to form solid MoO_3.

(1) Molybdenum determined colorimetrically. (2) Lead determined colorimetrically.

Fusion-point data for mixtures of $PbMoO_4 + PbSO_4$ are given by Germs, 1907, and Jaeger and Germs, 1921.

LEAD NITRATE $(PbNO_3)_2$.

Solubilities of the Nitrates of Lead Isotopes in Water at 25°.02.

(Richards and Schumb, 1918.)

The two samples of nitrate were prepared, one from salt made from « test lead » free from silver and tin, and the other from pure Australian uranio-lead nitrate. Saturation was approached from above and below the selected temperature, by constant rotation of a large excess of the solid with distilled water. Saturation was reached with extreme slowness. At least 24 hours were required. Weighed portions of the saturated solution were evaporated with H_2SO_4 and the lead sulfate weighed after heating to constant weight at 350°.

Sample of Lead Nitrate from :	Gms. $Pb(NO_3)_2$ per 100 gms. Sat. sol.	Water.
Common Lead.....	37.342	59.597
Uranio Lead.....	37.280	59.439
Difference.....	0.062	0.158

An experiment similar to the above is reported by Fajans, Fischler and Lembert, 1916. These authors prepared very pure nitrate from ordinary commercial lead of at. wt. 207.15 and from lead prepared from Colorado carnotite, and having an at. wt. of 206.59. Saturation was approached from above and below by constant agitation for at least two days at 24°.43. Very accurate specific gravity determinations of the saturated solutions were also made. The determination of the lead was made as sulfate.

Sample of Lead Nitrate from:	$d^{24.45}_{4}$ of sat. sol.	$PbSO_4$ found in 3.0445 cc. of sat. sol.		Mol. Solubility.
Ordinary Lead.....	1.444499 ± 0.000013	1.4693	=	0.004855
Carnotite.....	1.443587 ± 0.000016	1.4740	=	0.004861
Joachimsthaler Pechblend..	1.443586 ± 0.0000015			
		Difference....		0.000006

The authors conclude from the density experiment that a difference exists in the sp. gr. of the saturated solutions of the nitrates of lead isotopes which is slightly greater than that calculated. The difference in the molecular solubility is less than 1 %, while the difference in atomic weight is 2.7 %.

Equilibrium in the System Lead Nitrate, Potassium Nitrate and Water.

(Glasstone and Saunders. 1923.)

Results at 25°. Gms. per 100 gms. sat. sol.		Results at 50°. Gms. per 100 gms. sat. sol.		Results at 100°. Gms. per 100 gms. sat. sol.		Solid Phase at each temp.
KNO_3.	$Pb(NO_3)_2$.	KNO_3.	$Pb(NO_3)_2$.	KNO_3.	$Pb(NO_3)_2$.	
0.0	37.17	0.0	44.79	0.0	55.65	$Pb(NO_3)_2$
2.75	37.37	5.90	44.44	3.79	53.44	»
4.90	37.95	11.26	44.75	15.98	49.93	»
8.42	39.27	16.16	44.61	36.90	44.5	»
14.73	40.86	19.38	44.38	–	–	»
–	–	27.47	43.45	–	–	»
–	–	30.98	43.05	–	–	»
24.67	41.93	33.14	42.14	–	–	» + KNO_3
24.92	40.99	36.33	32.32	51.24	27.04	KNO_3
25.93	28.05	37.69	26.47	71.00	0.0	»
26.93	9.24	41.72	12.03	–	–	»
27.03	15.14	45.51	0.00	–	–	»
27.39	0.0	–	–	–	–	»

EQUILIBRIUM IN THE SYSTEM LEAD NITRATE, SODIUM NITRATE AND WATER
(Glasstone and Saunders, 1923)

Results at 0°. Gms. per 100 gms. sat. sol.		Results at 25°. Gms. per 100 gms. sat. sol.		Results at 50°. Gms. per 100 gms. sat. sol.		Solid Phase at each temp.
$NaNO_3$.	$Pb(NO_3)_2$.	$NaNO_3$.	$Pb(NO_3)_2$.	$NaNO_3$.	$Pb(NO_3)_2$.	
0.0	28.70	6.02	30.89	0.0	44.79	$Pb(NO_3)_2$
2.91	25.80	10.04	27.86	4.32	40.27	»
Results at 100°.		20.94	22.33	8.75	35.77	»
0.00	55.65	30.08	18.99	17.55	29.22	»
4.24	50.78	36.43	16.86	29.87	22.88	»
		40.32	15.47	43.84	17.25	» + $NaNO_3$
		41.32	13.17	47.09	11.35	$NaNO_3$
		45.71	4.30	49.80	6.35	»
		47.86	0.00	53.29	0.00	»

100 gms. pyridine dissolve 4.39 gms. Pb $(NO_3)_2$ at 0° and 5.46 gms. at 25°.
(Müller. R., 1924.)

LEAD OLEATE $Pb(C_{18}H_{33}O_2)_2$.

100 gms. anhydrous ether dissolve 9.59 gms. Pb $(C_{18}H_{33}O_2)_2$ at 25°.
(Thomas and Yu, 1923.)

LEAD OXIDES.

SOLUBILITY OF LEAD OXIDE (PbO) IN WATER.
(Remy and Kuhlmann, 1924; Remy, 1925.)

Millimols. PbO per liter at 18°.	Milligrams. PbO per liter at 20°.	Method.
0.055	12.34	Calc. from electrolytic conductivity.
0.055	12.39	Conducto titrametric determination of used amt. of acid for saturation.

The SOLUBILITY PRODUCT of red lead monoxide in water at 25° is 1.17×10^{-15} and the solubility is 0.26×10^{-3} gm. mol. per liter (Glasstone, 1921). The author states that this rough comparison emphasizes the uncertainty of the ionization of lead monoxide in water and the futility of determining the solubility of lead monoxide or hydroxide in water by the conductivity method.

SOLUBILITY OF DIFFERENT FORMS OF LEAD HYDROXIDE IN AQUEOUS NORMAL SOLUTIONS OF SODIUM HYDROXIDE.

Form of PbO used.	Manner of attaining saturation.	t°.	Gm. mol. PbO per liter sat. sol.	Authority.
Ordinary	Gentle shaking (14 days).	20	0.045 (aver of 8 det.)	Glasstone, 1921
»	Vigorous shaking (14 d.).	20	0.047 (» »)	»
Redish-brown-yellow	Stirring gently with air bubbles.	20	0.039	»
Red	» »	20	0.035	»
Yellow	» »	20	0.0237*	Appleby and Reid, 1922
Red	» »	20	0.0140*	Appleby and Reid, 1922

*Mean values obtained after stirring with slow stream of air up to 5 months. According to Glasstone the differences are explainable on the grounds of the varying size of the particles. Appleby and Reid consider that the results indicate that the yellow and red forms are polymorphic modifications of lead monoxide.

SOLUBILITY OF HYDRATED LEAD MONOXIDE AT 25° IN AQUEOUS SOLUTIONS OF :
(Glasstone, 1922.)

Sodium Hydroxide

Normality of Aq. NaOH.	Gm. mols. per liter sat. sol. $PbO.xH_2O$.	Na plumbite.	Residual NaOH.
0.0499	0.00392	0.00347	0.0464
0.1177	0.00881	0.00836	0.1093
0.2496	0.0178	0.01735	0.2323
0.4993	0.0345	0.03405	0.4653
0.7489	0.0484	0.04795	0.7010
0.9985	0.0620	0.06155	0.9370

Potassium Hydroxide.

Normality of Aq. KOH.	Gm. mols. $Pb.O.xH_2O$ per liter sat. sol.
0.1177	0.00892
0 9985	0.0631

The above repetition of Herz, 1901, experiments fail to confirm his results. Pleissner's (1907) hydrated oxide was used.

SOLUBILITY OF LEAD SESQUIOXIDE (Pb_2O_3) IN AQUEOUS SODIUM HYDROXIDE SOLUTIONS. (Glasstone, 1922 *a*.)

Solution of plumbite, plumbate and dilute alkali or water were mixed in various proportions and kept 4 or 5 weeks at room temperature. The supernatant solution above the precipitated sesquioxide was removed and analyzed. Equilibrium was reached very slowly.

Gram mols. per liter sat. sol.

NaOH.	Plumbite $\times 10^3$.	Plumbate $\times 10^3$.	$\frac{[HPbO_2'][PbO_3'']}{[OH']^3} \times 10^6$.
1.20	8.75	0.412	2.09
1.26	12.12	0.35	2.08
1.79	1.60	11.50	3.20
2.41	20.0	1.20	1.72
2.63	21.5	2.65	3.12

Data for the equilibrium in the system lead oxide + lead hydroxide + plumbite + Na OH + H_2O are given by Erich Muller, 1924 *a*.

Fusion-point data for mixtures of Pb O + $Mo O_3$, Pb O + $S O_3$ and Pb O + $W O_3$ are given by Jaeger and Germs, 1921. Results for Pb O + P_2O_5 and Pb O + V_2O_5 are given by Amadori, 1916-1917. Results for Pb O + $Pb_3(PO_4)_2$ and Pb O + $Pb(VO_4)_2$ are given by Amadori, 1914. Results for Pb O + $PbSO_4$ are given by Schenck and Albero, 1919.

LEAD PALMITATE $Pb(C_{16}H_{31}O_2)_3$.

100 gms. of a sat. sol. of lead palmitate in turpentine contain 0.106 gms. $Pb(C_{16}H_{31}O_2)_3$ at 15°. (Morrell, 1918.)

LEAD PHOSPHATES, Primary, $PbH_4(PO_4)_2$; Secondary, $PbHPO_4$.

EQUILIBRIUM IN THE SYSTEM LEAD OXIDE, PHOSPHORIC ANHYDRIDE AND WATER AT 25°. (Fairhall, 1924.)

The mixtures were rotated in a thermostat for several weeks, and the solutions analyzed from time to time untill equilibrium was reached. The composition of the solid phases was determined by the Schreinemaker residue method.

d_4^{25} of sat. sol.	Gms. per 100 cc. sat. sol. P_2O_5.	PbO.	Solid Phase.	d_4^{25} of sat. sol.	Gms. per 100 cc. sat. sol. P_2O_5.	PbO.	Solid Phase.
1.036	5.273	0.138	$PbHPO_4$	1.302	45.335	1.175	$PbHPO_4$
1.074	10.675	0.245	»	1.375	54.944	1.495	»
1.113	16.060	0.366	»	1.448	66.231	2.142	»
1.151	21.684	0.587	»	1.516	76.906	1.971	$PbH_4(PO_4)_2$
1.190	27.263	0.821	»	1.549	82.190	1.547	»
1.227	32.809	0.954	»	1.576	86.406	1.190	»
1.264	39.184	1.001	»	1.635	95.696	0.774	»

LEAD PHTHALATE $PbC_6H_4(COO)_2o$.

Data for the solubility of lead phthalate in water are given by Blecta, 1919.

Normal **LEAD** Trinitro **RESORCINOLATE.**

100 gms. glycol diacetate ($CH_3.CO\,O.CH_2 — CH_2\,O\,OC.CH_3$) dissolve 0.1 gm. normal lead trinitro resorcinolate at 20-25°. (Taylor and Rinkenbach, 1926.

LEAD STEARATE $Pb[CH_3(CH_2)_{16}COO]_2$.

100 cc. chloroform sat. at ord. temp. with Lead Stearate contain from 0.0056 to 0.0094 gm. stearic acid.

100 cc. ethyl ether sat. at ord. temp. with Lead Stearate contain from 0.019 to 0.021 gm. stearic acid.

Approx. determinations of the solubility of lead salts of other fatty acids in a mixture of 3 vols of $CH Cl_3$ and 1 vol. of acetone at 0° are also given. (Strauli, 1918, 1926.)

100 gms. anhydrous ether dissolve 0.021 gms. lead stearate at 25°. (Thomas and Yu, 1923.)

LEAD SUCCINATE $Pb(C_4H_4O_4)$.

SOLUBILITY OF LEAD SUCCINATE IN WATER AND IN AQUEOUS SOLUTIONS AT 18°.
(Auerbach and Weber, 1925.)

Solvent.	Gms. $Pb(C_4H_4O_4)$ per liter sat. sol.
Water	0.228 (the sat. sol. has $p_H = 6.1$)
Aq. 0.01 *n* HCl	2.04
» 0.10 *n* HCl	6.98
» 1.0 *n* CH_3COONa	9.60
» 1.0 *n* CH_3COONH_4	13.21

LEAD SULFATE $PbSO_4$.

1000 cc. H_2O dissolve 0.032 gm. $PbSO_4$ at 15° as determined by a new optical method using an interferometer of the type described by Janin (*Ann. chim. phys.*, 52, 171, 1858). (Mitchell, 1926.)

SOLUBILITY OF LEAD SULFATE IN AQUEOUS SOLUTIONS OF PERCHLORIC ACID AND OF MIXTURES OF PERCHLORIC ACID AND SULFURIC ACID AT 25°.
(Willard and Kassner, 1926.)

Composition of solvent in mols. per liter.	Dissolved $PbSO_4$. Gms. per 100 cc.	Millimols. per 100 cc.	Composition of solvent in mols. per liter.	Dissolved $PbSO_4$. Gms. per 100 cc.	Millimols. per 100 cc.
0.1 Mol. $HClO_4$	0.0278	0.0917	0.5 Mol. $HClO_4$ + 0.01 Mol. H_2SO_4	0.0137	0.0451
0.5 »	0.0528	0.1742	0.1 » + 0.02 »	0.0024	0.0079
1.0 »	0.0714	0.2301	0.5 » + 0.02 »	0.0067	0.0220
2.0 »	0.0787	0.2596	0.1 » + 0.05 »	0.0013	0.0043
3.0 »	0.0687	0.2266	0.5 » + 0.05 »	0.0030	0.0099
4.2 »	0.0490	0.1616	0.1 » + 0.10 »	0.0010*	0.0033*
0.1 » + 0.005 Mol. H_2SO_4	0.0070	0.0230	0.1 » + 0.25 »	0.0008*	0.0026*
0.5 » + »	0.0206	0.0679	0.1 » + 0.50 »	0.0003*	0.0010*
1.0 » + »	0.0367	0.1211	0.1 » + 0.50 Mol. $Pb(ClO_4)_2$	0.0002	0.0007

* Lead determined colorimetrically.

SOLUBILITY OF LEAD SULFATE IN AQUEOUS SOLUTIONS OF NITRIC ACID AND OF MIXTURES OF NITRIC ACID AND SULFURIC ACID AT 25°.
(Willard, and Kassner, 1926.)

Composition of solvent in mols. per liter.	Dissolved $PbSO_4$. Gms. per 100 cc.	Millimols. per 100 cc.	Composition of solvent in mols. per liter.	Dissolved $PbSO_4$. Gms. per 100 cc.	Millimols. per 100 cc.
0.1 Mol. HNO_3	0.0426	0.1405	1.0 Mol. HNO_3 + 0.005 Mol. H_2SO_4	0.1007	0.3322
0.5 »	0.0992	0.3272	0.5 » + 0.01 »	0.0328	0.1082
1.0 »	0.2021	0.6667	0.5 » + 0.02 »	0.0159	0.0524
2.0 »	0.3605	1.1890	0.1 » + 0.05 »	0.0015	0.0049
3.0 »	0.5389	1.7770	0.5 » + 0.05 »	0.0089	0.0293
4.2 »	0.7263	2.3960	0.1 » + 0.25 »	0.0011	0.0036
0.1 » + 0.005 Mol. H_2SO_4	0.0078	0.0257	0.1 » + 0.5 »	0.0009	0.0030
0.5 » + 0.005 »	0.0398	0.1313	0.1 » + 0.5 Mol. $Pb(NO_3)_2$	0.0008	0.0026

SOLUBILITY OF LEAD SULFATE IN AQUEOUS SOLUTIONS OF SULFURIC ACID.
(Frisak, 1922.)

Aqueous lead nitrate solution was added, by means of a buret, to aqueous sulfuric acid solutions at definite temperature untill a permanent cloud remained. The results were plotted and the following values read from the curve.

t°.	Gms. Pb dissolved per 100 gms. sat. solution in Aq. H_2SO_4 containing							
	60% H_2SO_4.	65% H_2SO_4.	70% H_2SO_4.	75% H_2SO_4.	80% H_2SO_4.	85% H_2SO_4.	90% H_2SO_4.	95% H_2SO_4.
16...	0.002	0.002	0.002	0.0021	0.0025	0.004	0.008	0.024
127...	0.0035	0.0042	0.005	0.007	0.009	0.014	0.024	0.060
149...	0.006	0.0075	0.009	0.013	0.018	0.030	0.055	–
166...	–	0.010	0.014	0.021	0.032	0.048	–	–

A saturated solution of $PbSO_4$ in aqueous sulfuric acid of concentration between 0.1 and 20 per cent H_2SO_4, contains between 0.0071 and 0.0105 gm. $PbSO_4$ per liter at 30°. (Dawkins and Weldon, 1922, 1925.)

SOLUBILITY OF LEAD SULFATE IN CONCENTRATED AND FUMING SULFURIC ACID AT ABOUT 18°. (Ditz and Kanhäuser, 1916.)

The solutions were analyzed after being shaken from time to time during three days, and the analyses repeated after an additional two days.

Per cent concentration of sulfuric Acid		Gms. $PbSO_4$ per 100 gms.	Per cent concentration of sulfuric Acid		Gms. $PbSO_4$ per 100 gms.	Per cent concentration of sulfuric Acid		Gms. $PbSO_4$ per 100 gms.
H_2SO_4.	free SO_3.	sat. sol.	H_2SO_4.	free SO_3.	sat. sol.	H_2SO_4.	free SO_3.	sat. sol.
91.27	–	0.047	98.63	–	1.29	101.13	5.02	3.54
93.78	–	0.063	98.94	–	1.34	101.45	6.4	3.78
96.04	–	0.147	99.52	–	2.51	102.5	11.1	6.00
97.01	–	0.210	100.01	0.044	4.21	103.4	15.1	7.22
98.11	–	0.54	100.2	0.89	3.97	105.05	22.4	8.23
98.37	–	0.70	100.5	2.22	3.62			

Fusion-point data for mixtures of $PbSO_4$ and $PbWO_4$ are given by Jaeger and Germs, 1921.

LEAD SULFIDE PbS.

Fusion-point data for mixtures of PbS and Tl_2S are given by Canneri and Fernandes, 1925.

LEAD SULFONATES.

SOLUBILITY OF SEVERAL LEAD NAPHTHALENE AND NAPHTHYLAMINE SULFONATES IN WATER.

Compound.	Formula.	t°.	Gms. anhydrous cmpd. per 100 cc. sat. sol.	Gms. anhydrous cmpd. per 100 gms. H_2O.
Lead Naphtalene–2–sulfonate.....	$Pb(C_{10}H_7SO_3)_2.H_2O$	16.5	0.541	– (1)
α » » mono »	α $Pb(C_{10}H_7SO_3)_2.3H_2O$	10	–	3.7 (2)
β » » » »	β »	10	–	0.87 (2)
» » 2.6–disulfonate.....	$PbC_{10}H_6(SO_3)_2$	25	–	0.19 (3)
» » 2.7 »	»	25	–	8.2 (3)
» » 5–chlor–1–sulfonate..	$Pb(C_{10}H_6.Cl.SO_3)_2.2H_2O$	20	0.20	– (1)
» » 6–oxy–2–sulfonate...	$Pb(C_{10}H_6OH.SO_3)_2.6H_2O$	20	1.814	– (1)
» Naphthylamine disulfonate–2.6.8.	$Pb(C_{10}H_5NH_2.SO_3)_2$	15	–	80.19 (4)
» » » –2.5.7.	»	15	–	92.66 (4)

(1) Ephraim and Pfister, 1925 *a*. (3) Haller and Lynch, 1924.
(2) Merz and Mülhauser, 1870. (4) Braunschweig, 1922, 1926.

SOLUBILITY OF LEAD β NAPHTHALENE MONO SULFONATE IN AQUEOUS SOLUTIONS OF LEAD α NAPHTHALENE MONO SULFONATE AT 24°.9. (Euwes, 1909.

Gms. α salt. added per 100 cc.	Gms. total α and β salt. found per 100 cc.	Gms. β salt dissolved per 100 cc. sat. sol.
0.00	0.407	0.407
0.095	0.468	0.373
0.189	0.539	0.350
0.284	0.604	0.320
0.473	0.738	0.265
0.945	1.114	0.169
1.890	1.969	0.079

These results were used as the basis of a method for the analysis of unknown mixtures of α and β naphthalene mono sulfonic acids. The unknown mixture was converted to the lead salt and its solubility compared with the above results.

SOLUBILITY OF LEAD NAPHTHALENE 2.6 DISULFONATE IN AQUEOUS SOLUTIONS OF LEAD NAPHTHALENE 2.7 DISULFONATE AT 25°.

(Haller and Lynch, 1924.)

An excess of the 2.6 salt was constantly agitated in a thermostat for 24 hours with 100 cc. of H_2O containing increasing amounts of the 2.7 salt.

Gms. anhydrous Lead 2.7 salt per 100 cc.	Gms. total 2.7 and 2.6 salt per 100 cc. sat. sol.	Gms. dissolved 2.6 salt per 100 cc.
0.0	0.188	0.188
0.395	0.483	0.088
0.98	1.045	0.065
1.58	1.595	0.015
1.966	2.008	0.042
1.966	2.043	0.077
2.97	2.98	0.010
8.23 (sat.)	8.20	–

LEAD TARTRATES Active, $PbC_4H_4O_6$; Racemic, $Pb_2C_8H_8O_{12}.4H_2O$.

SOLUBILITY OF EACH SEPARATELY IN WATER.

(Duboux and Cuttat, 1921.)

Results for the Active salt.

t°.	Gms. $PbC_4H_4O_6$ per 100 gms. sat. sol.	Solid Phase.
0.....	0.0027	$Pb.C_4H_4O_6$
12.5....	0.0030	»
25.....	0.0035	»
37.5....	0.0046	»

Results for the Racemic salt.

t°.	Gms. $Pb_2C_8H_8O_{12}$ per 100 gms. sat. sol.	Solid Phase.
0.....	0.0038	$Pb_2C_8H_8O_{12}.4H_2O$
12.5....	0.0020	»
25.....	0.0034	»
37.5....	0.0066	»

SOLUBILITY OF LEAD TARTRATE IN WATER AND IN AQUEOUS SOLUTIONS AT 18°.

(Auerbach and Weber, 1925.)

Solvent.	Gms. $PbC_4H_4O_6$ per liter sat. sol.	Solvent.	Gms. $PbC_4H_4O_6$ per liter sat. sol.
Water.....	0.0125 (p_H = 5.6)	Aq. 4.0 *n* CH_3COONa..	14.64
Aq. 0.01 *n* HCl..	0.526	» 1.0 *n* CH_3COONH_4.	1.95
» 0.10 *n* »	6.75	» 4.0 *n* » .	13.02
» 1.0 *n* CH_3COONa.	1.38	» 50 wt. % C_2H_5OH.	0.00

LEUCINE (α-aminoisocaproic acid) $CH_3(CH_2)_3CH(NH_2)COOH$.

SOLUBILITY OF LEUCINE IN WATER AND IN AQUEOUS SALT SOLUTIONS AT 21°.

(Pfeiffer and Angern, 1924.)

A saturated aqueous solution of the amino acid was prepared by constant shaking in a thermostat for 3 days. To five cc. portions of this sat. solution amounts of the salts to yield 0.02 molecular concentration were added and the shaking continued for another 3 days. The amino acid salted out was filtered, dried at 120-130° and weighed. That remaining in solution was calculated by difference.

Solvent.	Gms. Leucine per liter sat. solution.
Water.....	22.24
Aq. 0.02 mol. CH_3COOK per liter.....	19.36
» 0.02 » $(NH_4)SO_4$ »	9.12
» 0.02 » NaCl »	13.94

One liter sat. solution of **d, l, leucine** in water contains 10.11 gms., and one liter sat. solution in Aq. 0.1 *n* HCl contains 13.16 gms. of the compound at 21°.

(von Euler and Rudberg 1924, 1925.)

SOLUBILITY OF *d. l.* LEUCINE IN WATER AND IN AQUEOUS SOLUTIONS OF SALTS AT 20°. (Pfeiffer and Würgler, 1916.)

Gms. mols. salt per liter solvent.	Gms. Leucine per liter sat. sol.	Gms. mols. salt per liter solvent.	Gms. Leucine per liter sat. sol.
0.0 (Water).....	9.76	0.25 Mol. $BaCl_2$.....	10.61
1.27 Mol. LiCl....	9.45	0.50 » »	11.28 (11.49)
2.28 » »	8.66	1.00 » »	11.17
2.54 » »	8.93	0.25 » $SrCl_2$.....	10.34
5.07 » »	9.85	0.50 » »	10.98 (11.49)
11.4 » »	9.13	1.0 » »	10.82
0.5 » NaCl....	8.86	2.0 » »	10.34
1.0 » »	8.08	0.487 » $BaBr_2$.....	12.08
2.0 » »	6.70	0.457 » $Ba(ClO_4)_2$.....	13.15
4.0 » »	3.87	0.1 » HCl.....	22.19
Sat. sol. »	2.49	0.1 » » + 1.9% mol. LiCl.....	14.12
0.5 Mol. KCl.....	8.93	0.1 » » + 2.0 » KCl.....	18.29
1.0 » »	8.01	0.1 » » + 2.0 » KNO_3.....	20.04
2.0 » »	6.37	0.1 » NaOH.....	22.74
Sat. sol. »	3.55	0.1 » » + 2.06 mol. LiCl....	21.25
2.0 Mol. KBr...	7.02	0.1 » » + 2.0 » NaCl....	19.11
2.0 » KI.....	8.01	0.1 » » + 2.0 » KCl.....	19.19
2.0 » KNO_3..	9.19	0.1 » » + 2.0 » KBr.....	19.66
0.297 » $CaCl_2$..	10.75	0.1 » » + 2.0 » KNO_3.....	20.59
0.571 » » ..	12.43	0.5 » »	14.41
0.594 » » ..	11.51	0.5 » » + 2.04 mol. L_1Cl....	13.75
1.18 » » ..	12.68	0.5 » » + 2.0 » NaCl...	13.41
2.37 » » ..	13.96	0.5 » » + 2.0 » $NaNO_3$..	13.52

The above determinations were made by shaking the mixtures in a thermostat for 2 days and titrating the clear solution by the Sörensen method. A titration after an additional period of 1 day showed that complete saturation had been reached in all cases.

SOLUBILITY OF LEUCINE IN AQUEOUS SOLUTIONS OF DIFFERENT HYDROGEN ION CONCENTRATION AT 25°. (Sano, 1926.)

A large excess of leucine was shaken in a thermostat at 25° with the aqueous solvent. The saturated solution was filtered and a portion used for the determination of p_H by means of the hydrogen electrode and another portion for the determination of nitrogen by the micro Kjeldahl method using iodometric titration according to Bang.

Aq. solvent.	p_H of sat. sol.	Gms. N per liter sat. sol.	Aq. solvent.	p_H of sat. sol.	Gms. N per liter sat. sol.
0.333 *n* HCl	2.15	7.339	0.005 *n* NaOH..	8.36	2.898
0.100 *n* »	2.49	4.719	0.05 *n* » ..	9.12	3.742
0.02 *n* »	3.07	3.298	0.10 *n* » ..	9.41	4.659
0.10 *n* CH_3COOH....	3.51	2.915	0.40 *n* » ..	9.81	7.137
0.01 *n* CH_3COOH+.. } 0.2 *n* CH_3COONa.. }	6.00	2.588			

The minimum solubility at the isoelectric point is 2.588 gms. N. or 24.24 gm. leucine per liter at 25°.

LEVULINIC ACID (β acetyl propionic Acid) $CH_3COCH_2CH_2COOH$.

DISTRIBUTION OF LEVULINIC ACID BETWEEN WATER AND ETHER AT 25°. (Smith, 1921, 1922.)

Millimols. per liter		$\frac{C_2}{C_1}$	Millimols. per liter		$\frac{C_2}{C_1}$
Aq. layer (C_1).	$(C_2H_5)_2O$ layer (C_2).		Aq. layer (C_1)	$(C_2H_5)_2O$ layer C_2.	
1.725	0.500	0.2900	10.10	2.65	0.2625
2.57	0.725	0.2820	14.65	3.75	0.2575
5.15	1.40	0.2725			

DISTRIBUTION OF LEVULINIC ACID AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Chloroform. Millimols. per liter			Water and Xylene. Millimols. per liter		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
12.80	0.75	0.0586	26.0	0.50	0.0192
18.55	1.35	0.0728	35.0	0.80	0.0228
24.5	2.00	0.0817	51.7	1.40	0.0271

LIGNOCERIC ACID

SOLUBILITY OF LIGNOCERIC ACID IN AQUEOUS ALCOHOL AT 25°. (Thomas and Chai Lan Yu, 1923.)

The saturation was obtained by constant agitation and the saturated solutions were analyzed by evaporation and weighing the residue dried at 80°.

Solvent.	$d_{\frac{25}{4}}$ of Sat. sol.	Gms. Lignoceric Acid dissolved per 100 cc. sat. sol.	Gms. Lignoceric Acid dissolved per 100 gms. solvent.
Aq. 63.07 Wt. % C_2H_5OH.....	0.87783	0.011	0.013
» 86.16 » »	0.82356	0.092	0.112
» 91.53 » »	0.80935	0.182	0.226

LINOLENIC HEXABROMIDE $C_{18}H_{30}Br_6O_2$.

Qualitative determination of the solubility of linolenic hexabromide and of its Ba, Pb, K and Zn salts in 28 solvents are given by Imperial and West, 1926.

LITHIUM ACETATE $CH_3COOLi.2H_2O$.

SOLUBILITY OF LITHIUM ACETATE IN WATER. (Sidgwick and Gentle, 1922.)

t°.	Gms. CH_3COOLi per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. CH_3COOLi per 100 gms. sat. sol.	Solid Phase.
— 1.54....	2.63	Ice	53.3.....	52.23	$CH_3COOLi.2H_2O$
— 2.98....	4.83	»	55.4.....	56.60	»
— 6.62....	9.53	»	57.3.....	61.92	»
—16.12....	18.33	»	57.8(m. pt.).	64.25	»
± 0.....	23.76	$CH_3COOLi.2H_2O$	57.0.....	64.88	CH_3COOLi
+25.8.....	31.28	»	102.8.....	66 73	»
36.7.....	38.25	»	157.5.....	71.33	»
50.5.....	49.55	»	286(m. pt.)...	—	»

LITHIUM ARSENITE $LiAsO_2$.

EQUILIBRIUM IN THE SYSTEM LITHIUM OXIDE, ARSENIC TRIOXIDE AND WATER AT 25°. (Schreinemakers and de Baat, 1920.)

Four to six weeks constant agitation were required for saturation.

Gms. per 100 gms. sat. sol. Li_2O.	Gms. per 100 gms. sat. sol. As_2O_3.	Solid Phase.	Gms. per 100 gms. sat. sol. Li_2O.	Gms. per 100 gms. sat. sol. As_2O_3.	Solid Phase.
0.0	2.02	As_2O_3	5.36	6.32	$LiAsO_2$
0.45	6.45	»	6.45	6.98	»
0.84	10.26	$LiAsO_2$	7.35	7.47	»
0.89	3.74	»	7.64	7.50	»+$LiOH.H_2O$
2.26	4.19	»	7.81	3.81	$LiOH.H_2O$
4.24	5.65	»	7.15	0.0	»

LITHIUM BENZOATE $C_6H_5COOLi.H_2O$.

SOLUBILITY OF LITHIUM BENZOATE IN WATER. (Sidgwick and Ewbank, 1922.)

t°.	Gms. C_6H_5COOLi per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. C_6H_5COOLi per 100 gms. sat. sol.	Solid Phase.
— 1.69....	7.22	Ice	34.5.....	33.20	$C_6H_5COOLi.H_2O$
— 3.94....	13.69	»	84.5.....	34.61	C_6H_5COOLi
— 6.49....	19.85	»	111.0.....	36.51	»
0.....	27.97	$C_6H_5COOLi.H_2O$	162.4.....	45.14	»
+13.5.....	29.80	»	176.0.....	49.12	»
28.5.....	32.12	»			

LITHIUM *o* Hydroxy BENZOATE (Lithium Salicylate) $C_6H_4.OH.COOLi.H_2O$.

Solubility of Lithium Ortho Hydroxybenzoate in Water.
(Sidgwick and Ewbank, 1922.)

t°.	Gms. *o* $C_6H_4.OH.COOLi$ per 100 gms. sat. sol.	Solid Phase.
— 2.26...	10.17	Ice
— 5.56...	20.62	»
—12.82...	35.83	»
— 8.5....	45.20	*o* $C_6H_4.OH.COOLi.6H_2O$
— 1.0....	49.04	»
+ 9.0....	52.45	*o* $C_6H_4.OH.COOLi.H_2O$
3.5....	52.96	*o* $C_6H_4.OH.COOLi.6H_2O$ (unstable)
10.0....	59.96	*o* $C_6H_4.OH.COOLi.H_2O$
28.5....	56.50	*o* $C_6H_4.OH.COOLi.H_2O$
32.0....	57.50	»
38.5....	59.67	»
52.0....	64.18	» (unstable)
60.0....	66.56	» »
73.0....	66.56	*o* $C_6H_4.OH.COOLi$
113.0....	71.46	»
138.0....	75.77	»

Solubility of Lithium Meta and Para Hydroxybenzoates in Water.
(Sidgwick and Ewbank, 1922.)

Results for Meta Hydroxybenzoate.

t°.	Gms. *m* $C_6H_4.OH.COOLi$ per 100 gms. sat. sol.	Solid Phase.
— 4.41...	16.02	Ice
— 10.78...	29.58	»
— 17.67...	39.97	»
+ 10.0....	52.53	*m* $C_6H_4.OH.COOLi$
74.5....	55.04	»
104.0....	58.47	»
122.0....	61.86	»

Results for Para Hydroxybenzoate.

t°.	Gms. *p* $C_6H_4.OH.COOLi$ per 100 gms. sat. sol.	Solid Phase.
— 0.98...	5.04	Ice
— 2.37...	9.81	»
— 5.23...	17.88	»
— 9.28...	25.96	»
— 12.62...	31.54	» (unstable)
+ 12.5....	30.84	*p* $C_6H_4.OH.COOLi$
± 0.....	30.92	»
85.0....	31.96	»
113.0....	35.00	»

LITHIUM BORATE $LiBO_2.8H_2O$.

Solubility of Lithium Meta Borate in Water. (Rosenheim and Reglin, 1921.)

t°.	Gms. $LiBO_2$ per 100 gms. sat. sol.	Solid Phase.
0.0.....	0.89	$LiBO_2.8H_2O$
25.6.....	3.42	»
38.8.....	9.42	»
44.8.....	14.7	»

LITHIUM Per BORATE $Li_2B_2O_5.2\,1/2\,H_2O$.

100 cc. water dissolve 10.13 gm. lithium perborate at the ordinary temperature.
(Bezner-Löwy, 1923.)

LITHIUM BROMIDE LiBr.

Solubility of Lithium Bromide in Absolute Ethyl Alcohol.
(Bonnell and Jones, 1926.)

t°.	Gms. Li Br per 100 gms. C_2H_5OH.	Solid Phase.
0.....	32.61	Li Br
10.....	36.02	»
25.....	72.10	»
30.....	72.51	»
40.....	73.03	»
50.....	77.52	»
60.....	82.84	»
70.....	89.13	»
75.....	94.12	»
80.....	99.10	»

Between 13°.2 and 23°.8 lithium bromide alcoholate is formed and different values are obtained depending upon the solid phase present.

t°.	Gms. Li Br per 100 gms. C_2H_5OH when the Solid Phase is Li Br.	Li Br.4 C_2H_5OH.
13.2.....	70.0	70.0
15.....	70.2	38.1 (68.7)
16.....	70.4	39.0 (67.5)
20.....	70.8	42.0 (60.6)
23.....	71.2	46.0 (53.0)
23.8.....	71.3	47.2

The results in parentheses were obtained by thermal analysis. The eutectic point for Li Br + Li Br.4 C_2H_5OH is at 13.2°. The congruent m. pt. of Li Br.4 C_2H_5OH is 23.8°. Fusion-point data for mixtures of Li Br and K Br, Na Br, $MgBr_2$ and $SrBr_2$ are given by Kellner, 1917.

LITHIUM CARBONATE Li_2CO_3.

100 gm. sat. solution of lithium carbonate in water contain 1.513 gm. Li_2CO_3 at 0°. (Rosenheim and Reglin, 1921.)

LITHIUM Per CHLORATE $LiClO_4.3H_2O$.

Solubility of Anhydrous Lithium Perchlorate in Water and in Other Solvents at 25°. (Willard and Smith, 1923.)

Solvent.	*d* of solvent.	*d* of sat. sol.	Gms. $LiClO_4$ per 100 gms. sat. sol.
Water	–	1.2683	37.385
Methyl alcohol	0.78705	1.3849	64.57
Ethyl alcohol	0.78517	1.3173	60.28
n Propyl alcohol	0.7989	1.2006	51.22
n Butyl alcohol	0.8059	1.1326	44.23
iso Butyl alcohol	0.7981	1.0602	36.73
Acetone	0.7852	1.3233	57.72
Ethyl acetate	0.89457	1.3005	48.75
Ethyl ether	0.70817	1.2116	53.21

Solubility of Lithium Perchlorate Trihydrate in Several Solvents at 25°. (Willard and Smith, 1928.)

Solvent.	*d* of sat. sol.	Gms. $LiClO_4$ per 100 gms. sat. sol.	Solvent.	*d* of sat. sol.	Gms. $LiClO_4$ per 100 gms. sat. sol.
Methyl alcohol	1.1420	60.95	*iso* Butyl alcohol	0.8887	18.85
Ethyl alcohol	1.0241	42.16	Acetone	1.0965	49.04
n Propyl alcohol	0.9349	26.82	Ethyl acetate	1.0402	26.35
n Butyl alcohol	0.9082	21.40	Ethyl ether	0.7091	0.196

Solubility of Lithium Perchlorate Trihydrate in Mixtures of Ethyl Alcohol and Ethyl Acetate at 25°. (Smith, 1925.)

Vol. per cent C_2H_5OH in solvent.	Gms. $LiClO_4$ per 100 gms. sat. sol.	Vol. per cent C_2H_5OH in solvent.	Gms. $LiClO_4$ per 100 gms. sat. sol.
0.0 (= $CH_3COOC_2H_5$)	26.35	60.0	38.58
10.0	31.05	70.0	39.79
20.0	33.59	80.0	40.84
30.0	35.10	90.0	41.77
40.0	36.51	100.0	42.16
50.0	37.96		

LITHIUM CHLORIDE Li Cl.

Freezing-Points of Mixtures of Lithium Chloride and Water.

Results of Klein and Svanberg, 1920.		Results of Rodebush, 1918.	
Normality of Aq. Li Cl.	F. pt. of solution.	Gms. Li Cl per 100 gms. H_2O.	F. pt. of solution.
0.1	—0.360	5.48	— 5.11
0.25	—0.916	10.68	—12.22
0.50	—1.807	15.04	—18.75
		18.58	—25.44

Equilibrium in the System Lithium Chloride, Lithium Sulfate and Water at 30°. (Schreinemakers and Kayser, 1918.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
Li Cl.	Li_2SO_4.	Solid Phase.	Li Cl.	Li_2SO_4.	Solid Phase.
46.10	0.0	$LiCl.H_2O$	8.07	12.20	$Li_2SO_4.H_2O$
45.97	0.0	» + $Li_2SO_4H_2O$	5.74	15.71	»
30.74	0.0	$Li_2SO_4.H_2O$	3.98	18.85	»
21.04	1.08	»	2.76	20.43	»
15.30	4.48	»	0.96	23.60	»
12.06	7.48	»	0.00	25.25	»

Solubility of Lithium Chloride in Aqueous Solutions of Sodium Chloride and Vice Versa at 25°.

(Smits, Elgersma and Hardenberg, 1924.)

The saturated solutions were analyzed by a viscometric method and also by a modified synthetic method.

Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
Li Cl.	Na Cl.	Li Cl.	Na Cl.
45.8	0.0	33.5	0.3
45.5	0.5	31.6	0.8
41.3	0.4	24.9	2.3
40.1	0.2	17.4	7.3
36.8	0.3	16.9	8.4
35.7	0.3	6.5	19.0
33.5	0.4	0.0	26.4

Distribution of Lithium Chloride Between Water and Amyl Alcohol at 24°.9.

(Cavanagh, 1924.)

The mixtures were shaken in sealed tubes of about 600 cc. capacity. One of these was charged 10 times, precisely similarly, and provided a total of 2.5 liters of the amyl alcohol layer. These 10 successive samples of non aqueous equilibrium phase were shaken in turn with one and the same small aqueous phase (100 cc.) in a second tube, and this latter analyzed for Cl by a silver titration method. The procedure consisted essentially in the piece-meal concentration of a large amount of the phase to be analyzed, and the concentration of the Li Cl dissolved therein by a piece-meal extraction of it with water.

Approx. Normality of Li Cl in aq. Phase.	Gm. mols. Li Cl per 1000 gms.		Partition coefficient.
	Aq. phase.	Amyl alcohol phase.	
0.05	0.051	0.000152	0.0030
0.10	0.0996	0.0003115	0 00313
0.20	0.198	0.000662	0.00335

Distribution of Lithium Chloride Between Water and Amyl Alcohol at 30°.

(Dhar, 1926 *a*.)

Normality conc. of Li Cl in			Normality conc. of Li Cl in		
Aq. layer (C_1).	Alcoholic layer (C_2).	$\frac{C_1}{C_2}$.	Aq. layer (C_1).	Alcoholic layer (C_2).	$\frac{C_1}{C_2}$.
0.65	0.0030	216.7	2.76	0.0250	110.4
1.86	0.0125	147.2	2.82	0.0275	102.6
2.34	0.0220	117.0	2.93	0.0300	97.7
2.58	0.0225	113.4	3.06	0.0325	94.1
2.68	0.0240	111.7	3.24	0.0347	93.4

100 gms. sat. solution of Li Cl in normal butyl alcohol contain 11.49 gms. Li Cl at 25°, and the density of the sat. solution is $d_{\frac{25}{4}} = 0.8713$.

(Willard and Smith, 1922, 1923 *a*.)

Solubility of Lithium Chloride in Quinoline.

(Walton and Wise, 1922.)

t°.	Gms. Li Cl per 100 gms. Quinoline.	Solid Phase.	t°.	Gms. Li Cl per 100 gms Quinoline.	Solid Phase.
0.....	0.1515	$(C_9H_7N)_2$ Li Cl	56.4....	1.1734	$(C_9H_7N)_2$ Li Cl
25.....	0.3538	»	67.....	1.2353	»
40.....	0.6175	»	75.....	0.8180	»
45.....	1.0328	»	96.....	0.4588	»
50.....	1.1107	»			

100 gms. sat. solution of lithium chloride in selenium oxychloride ($SeOCl_2$) contain 3.21 gms. Li Cl at 25°. (Wise, 1923.)

Fusion-point data for mixtures of Li Cl + K Cl, Li Cl + Na Cl and Li Cl + K Cl + Na Cl are given by Schaeffer, 1919.

LITHIUM Platino CYANIDE $Li_2Pt(CN)_4.?H_2O$.

Solubility of Lithium Platinocyanide in Water.

(Terry and Jolly, 1923.)

t°.	Gms. $Li_2Pt(CN)_4$ per 100 gms. H_2O.	t°.	Gms. $Li_2Pt(CN)_4$ per 100 gms. H_2O.	t°.	Gms. $Li_2Pt(CN)_4$ per 100 gms. H_2O.	t°.	Gms. $Li_2Pt(CN)_4$ per 100 gms. H_2O.
0.0...	105.0	30.1...	152.3	40.0...	160.3	50.1...	175.0
16.3...	139.5	30.5...	156.1	42.5...	160.5	53.0...	182.0
22.2...	141.5	31.5...	152.0	42.7...	181.2	55.2...	173.8
23.0...	153.5	32.2...	152.4	43.1...	188.2	60.7...	178.0
24.1...	144.8	34.9...	166.6	43.2...	162.3	64.8...	185.7
25.0...	144.7	35.0...	154.6	45.0...	196.0	66.0...	205.2
25.7...	153.0	35.8...	155.6	45.7...	165.0	71.0...	204.0
25.8...	146.3	37.3...	173.0	46.6...	176.1	72 (tr. pt.)	
26.5...	147.5	38.0...	155.3	47.2...	186.0	78.2...	213.7
26.8...	151.2	38.8...	158.2	48.0...	173.0	88.2...	229.0
28.5...	148.5	39.2...	154.4	49.0 (tr. pt.)		89.8...	238.7
29.5 (tr. pt.)		39.5 (tr. pt.)		49.2...	173.1		

Equilibrium in the System Lithium Platinocyanide, Potassium Platinocyanide and Water at 24°.1.

(Terry and Jolly, 1923.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$Li_2Pt(CN)_4$.	$K_2Pt(CN)_4$.	Solid Phase.	$Li_2Pt(CN)_4$.	$K_2Pt(CN)_4$.	Solid Phase.
59.2	0.0	$Li_2Pt(CN)_4.?H_2O$	29.3	18.7	$LiKPt(CN)_4.2H_2O$
54.2	1.7	$LiKPt(CN)_4.2H_2O$	28.7	18.2	$K_2Pt(CN)_4.3H_2O$
54.1	2.2	»	27.3	16.1	»
52.1	2.7	»	23.0	19.8	»
45.9	4.4	»	22.0	19.4	»
38.9	9.2	»	19.3	20.2	»
36.5	11.2	»	10.2	23.6	»
34.0	12.3	»	6.1	26.5	»
30.5	13.9	»	4.6	26.9	»
28.5	16.1	»	0.0	28.6	»

LITHIUM FORMATE $HCOOLi.H_2O$.

Freezing-Points of Aqueous Lithium Formate Solutions.

(Sidgwick and Gentle, 1922.)

t° of f. pt.	Gms. HCOOLi per 100 gms. sat. sol.	Solid Phase.
— 4.27	5.80	Ice
— 9.02	10.98	»
—16.42	17.84	»

LITHIUM FLUORIDE.

Fusion-point data for mixture of Li_2F_2 and MgF_2 are given by Tacchini, 1924.

LITHIUM HYDROXYDE $LiOH.H_2O$.

100 gms. sat. solution of lithium hydroxide in water contain 11.35 gms. Li OH at 25° (= 8.79 mol. per cent Li OH). (Van Meurs, 1916.)

EQUILIBRIUM IN THE SYSTEM LITHIUM HYDROXIDE, PHENOL AND WATER AT 25°.
(Van Meurs, 1916.)

Mols. per 100 mols. sat. sol.			Mols. per 100 mols. sat. sol.		
LiOH.	C_6H_5OH,	Solid Phase.	LiOH.	C_6H_5OH.	Solid Phase.
8.79	0.0	$LiOH.H_2O$	4.36	30.48	$C_6H_5OLi.2H_2O$
8.30	0.23	»	3.85	45.05	»
8.25	0.41	»+$C_6H_5OLi.2H_2O$	3.56	51.34	»
5.26	1.02	$C_6H_5OLi.2H_2O$	2.32	68.19	»
2.64	2.37	»	2.08	68.71	»
3.25	7.72	»	2.11	70.42	»+C_6H_5OH
3.79	14.38	»	2.14	71.94	» »
4.28	22.64	»	1.82	73.11	C_6H_5OH

At concentrations of LiOH below 0.25 mol. per cent, liquid layers with the following composition are formed.

Aqueous layer.		Phenol layer.	
Mol. % LiOH.	Mol. % C_6H_5OH.	Mol. % LiOH.	Mol. % C_6H_5OH.
0.0	1.79	0.0	32.33
0.23	3.34	0.35	17.97

LITHIUM IODIDE $LiI.3H_2O$.

SOLUBILITY OF LITHIUM IODIDE IN WATER.
(Hüttig and Pohle, 1924.)

t°.	Gms. LiI per 100 gms. H_2O.	Solid Phase.	t°.	Gms. LiI per 100 gms. H_2O.	Solid Phase.
0.....	151	$LiI.3H_2O$	77.....	437	$LiI.2H_2O$ + $LiI.H_2O$
19.....	164	»	80.....	433	$LiI.1H_2O$
40.....	179	»	88.....	437	»
59.....	200	»	99.....	476	»
75.....	248	»	120.....	588	»
75.....	263	»	130.....	743	»
71.5....	286	»	130.....	782	»
70.5....	297	»+$LiI.2H_2O$	130.....	826	»+$LiI.^1/_2H_2O$
71.5....	306	$LiI.2H_2O$	130.....	835	$LiI.^1/_2H_2O$
79.....	372	»			

The authors also give vapor pressures and thermo chemical data.

LITHIUM MOLYBDATE $4Li_2MoO_4.3H_2O$.

SOLUBILITY OF LITHIUM MOLYBDATE IN WATER.
(Rosenheim and Reglin, 1921.)

t°.....	0°.	25°.	30°.	40°.	98°.
Gms. Li_2MoO_4 per 100 gms. sat. sol...	45.24	44.81	44.26	43.84	42.50

LITHIUM NITRATE $LiNO_3.3H_2O$.

EQUILIBRIUM IN THE SYSTEM LITHIUM NITRATE, LITHIUM SULFATE AND WATER AT 25° AND AT 35°. (Massink, 1918.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$LiNO_3$.	Li_2SO_4.	Solid Phase.	$LiNO_3$.	Li_2SO_4.	Solid Phase.	$LiNO_3$.	Li_2SO_4.	Solid Phase.
Results at 25°.			62.14	±0.0	$LiNO_3$+Li_2SO_4	19.25	7.41	11.1.17
47.58	0.0	$LiNO_3.3H_2O$	59.65	±0.0	Li_2SO_4	19.12	7.50	»+9.1.27
47.60	±0	»+$Li_2SO_4.H_2O$	57.91	±0.0	»+$Li_2SO_4.H_2O$	16.79	9.25	9.1.27
43.45	0.19	$Li_2SO_4.H_2O$	52.03	±0.0	$Li_2SO_4.H_2O$	12.31	13.13	»
33.90	1.14	»	50.55	±0 0	»+11.1.17	8.98	16.10	»
18.64	8.41	»	49.54	0.08	11.1.17	4.99	20.48	»
0.0	25.79	»	41.83	0.17	»	3.04	22.19	»
Results at 35°.			28 63	2.26	»	1.48	23.88	»
59.49	0.0	$LiNO_3.^1/_2H_2O$	22.18	5.16	»	0.76	24.55	$Li_2SO_4.H_2O$
61.93	0.0	$LiNO_3$	20.14	6.78	»	0.0	24.76	»
61.97	±0.0	»+Li_2SO_4						

11.1.17 = $11Li_2SO_4.LiNO_3.17H_2O$;
9.1.27 = $9Li_2SO_4.LiNO_3.27H_2O$

SOLUBILITY OF LITHIUM NITRATE IN SEVERAL SOLVENTS. (Müller, R. 1924.)

Solvent.	Gms. $LiNO_3$ per 100 cc. solvent at 0°.	25°.
Acetonitrile	—	2.99
Iso amyl alcohol	5.41	9 5
Pyridine	27.4	37.15

LITHIUM PHOSPHATE Li_3PO_4.

Aqueous solutions of lithium phosphate are colloidal and cannot be obtained clear. A solubility determination made by electrolytic conductivity gave 0.297 gm. Li_3PO_4 per liter sat. solution at 25°. (Rosenheim and Reglin, 1921.)

LITHIUM Sub PHOSPHATE $Li_2PO_3.3^1/_2H_2O$.

100 gms. sat. solution of lithium subphosphate in water contain 0.1018 gm. Li_2PO_3 at 0°, 0.0575 gm. at 25° and 0.048 gm. at 40°. These determinations are only approximately correct since it was impossible to obtain the saturated solution in a clear condition either by long standing or by filtration. A determination made by electrolytic conductivity gave 0.1267 gm. Li_2PO_3 per liter sat. sol. in water at 25°. (Rosenheim and Reglin, 1921.)

LITHIUM Hydrogen PHOSPHITE $Li_2HPO_3.H_2O$.

SOLUBILITY OF LITHIUM HYDROGEN PHOSPHITE IN WATER. (Rosenheim and Reglin, 1921.)

t°.	Gms. Li_2HPO_3 per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. Li_2HPO_3 per 100 gms. sat. sol.	Solid Phase.
0.....	9.07	$Li_2HPO_3H_2O$	45.....	6.29	$Li_2HPO_3H_2O$
25.....	7.47	»	51.....	6.09	»
30.....	7.07	»	61.....	5.75	»
35.....	6.82	»	98.....	4.24	»
40.....	6.64	»			

LITHIUM SELENITE $4Li_2SeO_3.3H_2O$.

SOLUBILITY OF LITHIUM SELENITE IN WATER. (Rosenheim and Krause, 1921.)

t°.....	0°.	25°.	37°.5.	60°.	100°.
Gms. Li_2SeO_3 per 100 gms. sat. sol....	19.99	16.76	14.53	12.75	9.05

LITHIUM SILICATE (ortho) Li_4SiO_4.

Fusion-point data for mixtures of $Li_4SiO_4 + Ca_2SiO_4$ and for $Li_4SiO_4 + ZrSiO_4$ are given by Schwarze and Haacke, 1921.

LITHIUM STANNATE $Li_2Sn(OH)_6$.

SOLUBILITY OF LITHIUM STANNATE AND OF HYDRATED LITHIUM STANNATE IN WATER. (Zocher, 1920.)

t°.	Gms. Li_2SnO_3 per 100 gms. sat. sol. in presence of $Li_2Sn(OH)_6$	$Li_2Sn(OH)_6.2H_2O$.
28.....	3.14	2.08
40.....	3.25	2.02
61.....	3.66	2.58
80.....	4.36	2.99

LITHIUM SULFATE Li_2SO_4.

Freezing-point data for mixtures of $Li_2SO_4 + H_2SO_4$ are given by Kendall and Landon, 1920.

LITHIUM TUNGSTATE Li_2WO_4.

Fusion-point data for mixtures of $Li_2WO_4 + K_2WO_4$, $Li_2WO_4 + Na_2WO_4$ and $Li_2WO_4 + WO_3$ are given by van Liempt, 1925.

LITHIUM VANADATE $Li_3VO_4.9H_2O$.

Solubility of Lithium Vanadate in Water. (Rosenheim and Reglin, 1921.)

t°.	Gms. Li_3VO_4 per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. Li_3VO_4 per 100 gms. sat. sol.	Solid Phase.
0.0	2.40	$Li_3VO_4.9H_2O$	38.4	5.09	$Li_3VO_4.H_2O$
20.8	4.60	»	40.0	4.20	»
28.6	5.25	»	45.0	3.70	»
30.2	5.91	»	50.0	2.80	»
35.2	6.25	»	60.0	2.60	»

MAGNESIUM Mg.

100 gms. sat. solution of magnesium in mercury contain 0.323 gm. Mg at 25°. (Loomis, 1922.)

Data for the distribution of magnesium between aluminium and lead and between aluminium and bismuth are given by Tammann and Schaftmeister, 1924.

MAGNESIUM ACETATE $Mg(CH_3COO)_2.4H_2O$.

Solubility of Magnesium Acetate in Water. (Rivett, 1926.)

t°.	Gms. $Mg(CH_3COO)_2$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $Mg(CH_3COO)_2$ per 100 gms. sat. sol.	Solid Phase.
− 0.364..	1.068	Ice	+ 0.1...	36.2	$Mg(CH_3COO)_2.4H_2O$
− 0.531..	1.804	»	14.9...	37.97	»
− 1.083..	3.08	»	24.9...	39.61	»
2.179..	5.92	»	35.0...	41.78	»
− 4.687..	11.45	»	45.0...	44.76	»
− 9.99...	19.81	»	55.0...	49.46	»
−15.28...	25.00	»	±68.0...	66.4 approx. m. pt. of	»
−29.0....	34.5	» + $Mg(CH_3COO)_2.4H_2O$			

MAGNESIUM ARSENATE.

Data for equilibrium in the system magnesium oxide, arsenic trioxide and water at 25° are given by Story and Anderson, 1924.

MAGNESIUM BENZOATE $Mg(C_6H_5COO)_2.4H_2O$.

MAGNESIUM 4-Nitro BENZOATE $Mg(C_6H_4.NO_2.COO)_2.6H_2O$.

100 cc. sat. solution of Magnesium benzoate in water contain 6.364 gms. $Mg(C_6H_5COO)_2$ at 20°.
100 cc. sat. solution of Magnesium 4-Nitro benzoate in water contain 1.840 gms. $Mg(C_6H_4NO_2COO)_2$ at 20°. (Ephraim and Pfister, 1925.)

MAGNESIUM BROMIDE $MgBr_2$.

100 cc. acetonitrile dissolve 13.35 gms. $MgBr_2$ at 25°. (Müller, R., 1924.)

100 cc. pyridine dissolve 0.49 gms. $MgBr_2$ at 18°, 0.54 gms. at 25° and 2.5 gms. at 60°. (Müller R., 1924.)

Fusion point data for mixtures of $MgBr_2$ + K Br and $MgBr_2$ + Na Br are given by Kellner, 1917.

MAGNESIUM CARBONATE $MgCO_3.3H_2O$.

Solubility of Magnesium Carbonate in Water Containing Increasing Amounts of Carbon Dioxide at 25°. (Mitchell, 1923.)

A silver lined steel bulb was used. The mixture was stirred by a current of CO_2.

Atmospheres pressure of Carbon Dioxide.	Mols. per liter of sat. solution. Total [Mg].	Total [CO_3].
6	0.376	0.896
9	0.450	1.147
11	0.485	1.250
13	0.505	1.350
16	0.530	1.395
21	0.613	1.738

Solubility of Magnesium Carbonate in Water Containing Carbon Dioxide under High Pressures and at Different Temperatures.

(Haehnel, 1924.)

The saturated solutions were prepared in a platinum vessel provided with an electrically driven stirrer and contained in an autoclave. After stirring one hour and allowing to stand one-half hour the saturated solution was withdrawn through a platinum tube and analyzed by evaporating and weighing the ignited Mg O. Equilibrium was approached from above. Magnesium carbonate from different sources was used.

Results at 18°.

Atmospheres Pressure.	Gms. $MgCO_3$ per 100 gms. sat. sol.
2.0	3.5
2.5	3.74
4.0	4.28
10.0	5.90
16.0	7.05
18.0	7.49
35.0	7.49
56.0	7.49

Results at different temperatures.

	Gms. $MgCO_3$ per 100 gms. sat. sol. at		
t°.	1 atmosphere of CO_2 (Engle and Ville).	5 atmospheres. of CO_2 (Beckurts).	34 atmospheres of CO_2 (Haehnel).
0...	–	–	8.58
5...	–	–	8.32
10...	–	3.57	7.93
30...	1.58	–	6.88
40...	1.18	1.37	6.44
50...	0.95	–	6.18
60...	–	–	5.56

The determinations of Beckurts and of Engle and Ville were made in 1881 and 1885.

Electrolytic conductivity results are also given by Haehnel.

Equilibrium in the System Magnesium Carbonate, Ammonium Carbonate and Water at 30°. (Lafontaine, 1925.)

To a concentrated solution of magnesium bicarbonate containing 20-25 grams $Mg(HCO_3)_2$ per liter, increasing quantities of ammonia, ammonium bicarbonate or of mixtures of the two were added. The solutions were agitated mechanically 10 hours per day for 8 days. The composition of the solid phase did not change but its quantity increased with time. The zones of formation of the several solid phases were determined.

Mols. per 100 mols. H_2O.			Solid Phase.	Mols. per 100 mols. H_2O.			Solid Phase.
MgO.	CO_2.	NH_3.		MgO.	CO_2.	NH_3.	
0.160	1.487	1.193	$MgCO_3.3H_2O$	0.006	1.593	10.386	1.1.4
0.103	2.508	2.099	»	0.091	2.172	1.932	» +$MgCO_3.3H_2O$
0.097	2.256	0.129	»	0.021	0.463	1.351	» »
0.041	0.816	0.875	»	0.019	0.888	1.402	» »
0.021	0.089	0.144	»	0.012	1.300	1.582	» »
0.020	0.292	1.168	»	0.008	0.084	5.562	4.1.4 + »
0.055	0.952	0.970	»	0.008	0.095	11.029	» »
0.075	2.427	2.233	1.1.4	0.020	0 220	3.783	» +5(»)
0.056	1.065	1.087	»	0.006	0.178	4.369	» »
0.026	1.315	1.514	»	0.015	0.196	5.524	» »
0.024	3.357	3.269	»	0.012	0.152	8.604	» »
0.016	0.623	1.277	»	0.001	0.010	10.981	»
0.008	3.745	3.837	»	0.007	0.102	15.710	»

1.1.4 = $MgCO_3.(NH_4)_2CO_3.4H_2O$, 4.1.4 = $4MgCO_3.Mg(OH)_2.4H_2O$.

MAGNESIUM Per CHLORATE $Mg(ClO_4)_2.6H_2O$ and $3H_2O$.

Solubility of Hydrated Magnesium Perchlorate in Water and of Anhydrous Magnesium Perchlorate in Other Solvents at 25°.
(Willard and Smith, 1926.)

Solvent.	*d* of solvent.	*d* of sat. sol.	Gms. $Mg(ClO_4)_2$ per 100 gms. sat. sol.	Solvent.	*d* of solvent.	*d* of sat. sol.	Gms. $Mg(ClO_4)_2$ per 100 gms. sat. sol.
Water.....	–	1.4720	49.90	*iso* Butyl alcohol.	0.7981	1.0609	31.27
Methyl alcohol...	0.78705	1.1057	34.14	Acetone.....	0.7864	1.0798	30.015
Ethyl alcohol....	0.78515	0.9518	19.33	Ethyl acetate.....	0.89457	1.3057	41.49
n Propyl alcohol.	0.7989	1.1926	42.33	Ethyl ether.....	0.7081	0.7101	0.29
n Butyl alcohol..	0.8059	1.1399	39.16				

MAGNESIUM CHLORIDE $MgCl_2.6H_2O$.

Freezing-points of Aqueous Solutions of Magnesium Chloride
(Rodebush, 1918.)

The temperatures were measured with thermoelements.

t° of freezing.....	−5.71.	−8.46.	−13.79.	−19.57.	−25.86.	−33.5. (Eutec.)
Gms. $MgCl_2$ per 100 gms. H_2O...	8.79	11.74	16.31	20.36	24.21	28.0

Equilibrium in the System Magnesium Chloride, Magnesium Sulfate and Water.

Results of Kournakow and Zemcuznyj, 1919, 1924 :

At 0°.

Mols. per 1000 mols. H_2O.		
$MgCl_2$.	$MgSO_4$.	Solid Phase.
99.8	0.0	$MgCl_2.6H_2O$
97.7	3.4	»+$MgSO_4.7H_2O$
84.0	3.3	$MgSO_4.7H_2O$
78.2	3.3	»
71.8	3.5	»
64.1	4.2	»
42.8	8.1	»
23.7	16.8	»
9.2	27.6	»
0.0	38.9	»

At 25°.

Mols. per 1000 mols. H_2O.		
$MgCl_2$.	$MgSO_4$.	Solid Phase.
104.9	0.0	$MgCl_2.6H_2O$
100.1	9.3	»+$MgSO_4.6H_2O$
91.6	9.0	$MgSO_4.6H_2O$
80.1	9.2	»+$MgSO_4.7H_2O$
68.3	10.7	$MgSO_4.7H_2O$
60.4	12.0	»
39.3	19.0	»
20.4	31.4	»
17.2	34.6	»
8.0	45.0	»

Results of Takegami, 1921, at 25°.

Gms. per 100 gms. sat. sol.		
$MgCl_2$.	$MgSO_4$.	Solid Phase.
35.86	0.0	$MgCl_2.6H_2O$
34.80	1.45	»
33.89	2.99	»
34.03	2.96	»+$MgSO_4.4H_2O$
33.56	2.81	$MgSO_4.4H_2O$
33.09	2.82	»
32.97	2.91	$MgSO_4.5H_2O$
32.48	3.04	»
30.79	3.87	»
32.36	3.85	$MgSO_4.6H_2O$
32.14	3.77	»
31.39	3.75	»
30.91	3.76	»
30.08	3.80	»

Gms. per 100 gms. sat. sol.		
$MgCl_2$.	$MgSO_4$.	Solid Phase.
28.72	4.14	$MgSO_4.6H_2O$
28.21	4.35	»
27.84	4.29	»
26.36	4.90	»
26.06	5.02	»+$MgSO_4.7H_2O$
23.53	5.44	$MgSO_4.7H_2O$
16.22	10.14	»
14.77	11.08	»
14.05	10.68	»
10.51	14.02	»
9.42	14.89	»
5.31	19.63	»
1.62	24.43	»
0.0	26.68	»

In both cases constant agitation was employed and all necessary precautions for accuracy were observed.

Equilibrium in the System Magnesium Chloride, Potassium Chloride and Water at Different Temperatures. (Keitel, 1923.)

t°.	Gms. per 100 gms. sat. sol. $MgCl_2$.	KCl.	Solid Phase.
15...	35.10	0.0	Bischofite
15...	27.59	2.76	KCl + Carnallite
15...	23.83	5.49	KCl
15...	16.57	10.73	»
15...	7.66	17.66	»
25...	35.60	0.0	Bischofite
25...	35.14	0.5	» + Carnallite
25...	27.70	3.70	KCl »
25...	26.81	4.56	KCl
25...	24.58	5.22	»
25...	23.10	6.06	»
25...	16.40	10.36	»
25...	15.64	11.54	»
25...	7.68	19.50	»
55...	37.55	0.0	Bischofite
55...	37.38	0.21	»
55...	36.88	0.62	» + Carnallite
55...	28.74	4.43	KCl »
55...	22.72	9.79	KCl
105...	43.47	0.0	Bischofite
105...	40.75	1.07	» + Carnallite
105...	36.51	3.62	Carnallite
105...	30.82	7.00	» + KCl
105...	21.44	14.83	KCl
105...	14.08	21.72	»
105...	13.97	21.87	»
105...	6.52	29.90	»
105...	0.0	36.45	»
15...	15.14	14.79	KCl
55...	7.24	23.40	»
83...	39.80	0.0	Bischofite
83...	37.80	1.01	» + Carnallite
83...	36.99	2.52	Carnallite
83...	29.45	5.80	» + KCl
83...	20.53	12.75	KCl
83...	14.63	18.31	»
83...	14.77	18.27	»
83...	7.15	26.85	»

Bischofite = $MgCl_2.6H_2O$; Carnallite = $MgCl_2,KCl.6H_2O$.

The following determinations at 25° are reported by Lee and Egerton, 1923.

$d_{\frac{25}{25}}$ of sat. sol.	Gms. per 100 gms. sat. sol. $MgCl_2$.	KCl.	Solid Phase.
1.341	35.54	0.0	$MgCl_2.6H_2O$
—	35.14	0.53	» + Carnallite
—	35.13	0.38	» »
—	35.47	0.52	» »
—	26.81	3.33	KCl »
—	26.79	3.20	KCl+Carnallite
—	26.66	3.19	»
1.234	19.83	7.90	KCl
1.201	12.11	13.56	»
1.182	0.0	26.74	»

Equilibrium in the System Magnesium Chloride, Sodium Chloride and Water at 0° and at 25°.

(Kournakov and Zemcuznyj, 1919, 1924.)

Results at 0°.

Mols. per 1000 mols. H_2O $MgCl_2$.	$NaCl_2$.	Solid Phase.
99.8	0.0	$MgCl_2.6H_2O$
98.0	1.7	» + NaCl
75.0	3.2	NaCl
49.1	12.8	»
38.0	20.0	»
18.95	37.0	»
0.0	54.9	»

Results at 25°.

Mols. per 1000 mols. H_2O $MgCl_2$.	$NaCl_2$.	Solid Phase.
104.9	0.0	$MgCl_2.6H_2O$
102.5	2.45	» + NaCl
95.0	3.0	NaCl
79.2	4.1	»
58.5	9.0	»
48.4	14.5	«
40.5	19.5	»
26.7	29.6	»
16.0	40.0	»
0.0	55.5	»

Equilibrium in the System Magnesium Chloride, Sodium Chloride and Water at Different Temperatures. (Keitel, 1923.)

t°.	Gms. per 100 gms. sat. sol. $MgCl_2$.	Gms. per 100 gms. sat. sol. NaCl.	Solid Phase.
15...	35.10	0.0	$MgCl_2.6H_2O$
15...	23.84	3.68	NaCl
15...	15.80	10.07	»
15...	7.60	18.95	»
25...	35.60	0.0	$MgCl_2.6H_2O$
25...	35.00	0.97	»+NaCl
25...	30.87	1.39	NaCl
25...	24.28	4.01	»
25...	9.68	16.38	»
25...	8.01	17.74	»
55...	37.55	0.0	$MgCl_2.6H_2O$
55...	37.51	0.28	»+NaCl
55...	34.49	0.97	NaCl
55...	30.80	1.65	»
55...	25.05	4.32	»
55...	23.59	5.01	»
55...	16.18	10.74	»
55...	8.29	18.34	NaCl
55...	7.37	19.30	»
55...	0.0	27.01	»
83...	39.81	0.0	$MgCl_2.6H_2O$
83...	38.80	0.40	»+NaCl
83...	34.89	0.74	NaCl
83...	30.86	2.28	»
83...	22.51	7.65	»
83...	15.37	12.91	»
83...	7.83	20.81	»
83...	0.9	27.60	»
105..	43.47	0.0	$MgCl_2.6H_2O$
105..	42.93	0.09	»+NaCl
105..	31.01	2.61	NaCl
105..	24.68	7.22	»
105..	0.0	28.35	»

A solution of Bischofite ($MgCl_2.6H_2O$) served as the starting solution. The solutions were stirred constantly for not less than two hours.

The following determinations at 25° are given by Takegami, 1921.

Gms. per 100 gms. sat. sol. $MgCl_2$.	Gms. per 100 gms. sat. sol. NaCl.	Solid Phase.
35.86	0.0	$MgCl_2.6H_2O$
35.73	0.21	»
35.68	0.48	»+NaCl
31.65	1.12	NaCl
24.40	4.11	»
18.79	7.80	»
9.15	16.62	»
6.24	19.77	»
0.5	26.49	»

Equilibrium in the System Magnesium Chloride, Magnesium Sulfate, Sodium Chloride, Sodium Sulfate and Water at 105°. (Mayeda, 1920.)

Mols. per 1000 mols. H_2O.				
$MgCl_2$.	$MgSO_4$.	Na_2Cl_2.	Na_2SO_4.	Solid Phase.
133.0	–	0.225	–	NaCl
139.5	–	trace	–	$MgCl_2.NaCl.6H_2O$
138.5	1.5	–	–	$MgCl_2.6H_2O + MgSO_4.H_2O$
123.1	2.02	–	–	$MgSO_4.H_2O$
–	76.69	–	–	»
–	64.31	–	13.07	$\text{»} + 2Na_2SO_4.2MgSO_4.5H_2O$
–	41.84	–	32.22	$3Na_2SO_4.MgSO_4 +$ »
–	49.88	–	11.05	$\text{»} + Na_2SO_4$
–	–	–	52.99	Na_2SO_4
–	–	57.99	8.054	$\text{»} + NaCl$
4.632	–	52.78	7.382	$\text{»} + \text{»} + 3Na_2SO_4.MgSO_4$
33.64	–	27.02	10.12	$NaCl + 3Na_2SO_4.MgSO_4 + 2Na_2SO_4.2MgSO_4.5H_2O$
55.40	–	9.978	11.32	$NaCl + 2Na_2SO_4.2MgSO_4.5H_2O + MgSO_4.H_2O$

EQUILIBRIUM IN THE SYSTEM MAGNESIUM CHLORIDE, MAGNESIUM SULFATE, SODIUM CHLORIDE, SODIUM SULFATE AND WATER AT 0° AND AT 25°.

(Kournakoff and Zemcuznyj, 1919, 1924.)

t°.	Mols. per 1000 mols H_2O. $MgCl_2$.	$MgSO_4$.	Na_2Cl_2.	Na_2SO_4.	Solid Phase.
0..	96.5	3.9	1.1	0.0	$MgCl_2.6H_2O+MgSO_4.7H_2O+NaCl$
0..	85.7	2.9	1.0	0.0	$MgSO_4.7H_2O+NaCl$
0..	48.2	6.0	11.0	0.0	» »
0..	25.2	12.0	25.3	0.0	$MgSO_4.7H_2O+Na_2SO_4.10H_2O+NaCl$
0..	23.7	13.3	19.2	0.0	$MgSO_4.7H_2O+Na_2SO_4.10H_2O$
0..	11.0	23.8	9.7	0.0	» »
0..	0.0	38.5	0.0	6.5	» »
25..	100.0 (101.85)	9.5 (3.78)	2.5 (0.28)	0.0	$MgCl_2.6H_2O+MgSO_4.6H_2O+NaCl$
25..	— (103.9)	0.0	0.0	0.0	» +NaCl
25..	— (102.3)	— (5.4)	0.0	0.0	» $+MgSO_4.6H_2O$
25..	— (77.0)	— (9.53)	0.0	0.0	$MgSO_4.7H_2O+$ »
25..	77.7 (75.5)	9.8 (9.78)	2.3 (3.39)	0.0	» + » +NaCl
25..	— (71.79)	— (18.0)	— (15.08)	0.0	» + 1.1.4 + »
25..	30.2	15.1	22.0	0.0	$MgSO_4$ + » + »
25..	53.6	13.8	8.8	0.0	$MgSO_4.7H_2O+NaCl$
25..	44.2	17.0	12.4	0.0	» »
25..	37.4	16.1	16.4	0.0	» »
25..	35.6	16.2	17.1	0.0	» »
25..	24.2	15.3	26.6	0.0	1.1.4+NaCl
25..	17.6	15.0	31.9	0.0	» »
25..	13.1	16.0	36.1	0.0	» »
25..	4.1	16.9	43.6	0.0	» »
25..	30.2	14.3	21.0	0.0	» $+MgSO_4(7H_2O?)$
25..	21.9	22.2	19.8	0.0	» »
25..	4.5	38.6	18.1	0.0	» »
25..	3.8	39.8	19.7	0.0	» »
25..	0.0	45.1	14.2	8.9	» »
25..	0.0	44.2	8.2	18.3	» »
25..	0.0	45.3 (47.99)	0.0	28.1 (24.97)	» »
25..	0.0	16.0	46.9	2.03	» + NaCl $+Na_2SO_4$
25..	0.0	15.9 (18.84)	46.8 (45.72)	2.5 (1.28)	» » »
25..	0.0	15.6	39.7	9.7	» $+Na_2SO_4.10H_2O+$ »
25..	0.0	17.2 (11.54)	30.4 (23.89)	16.6 (23.67)	» » »
25..	0.0	— [11.6]	— [26.3]	— [26.0]	» » » (Rose, 1925.)
25..	0.0	— [30.8]	— [10.2]	— [32.3]	» » » (Takegami, 1920.)
25..	0.0	17.7	28.5	18.6	» $+Na_2SO_4.10H_2O$
25..	0.0	18.1	25.4	20.1	» »
25..	0.0	19.3	22.6	24.3	» »
25..	0.0	20.2	20.8	25.6	» »
25..	0.0	25.0	11.8	31.3	» »
25..	0.0	36.2 (37.96)	0.0	35.8 (31.36)	» »
25..	0.0	17.2	30.1	16.6	» + » $+Na_2SO_4$
25..	0.0	16.0	46.8	2.2	» + NaCl + »
25..	0.0	0.0	31.4 (29.0)	26.9 (27.5)	$Na_2SO_4.10H_2O+Na_2SO_4$
25..	0.0	5.7	30.2	23.1	» »
25..	0.0	12.1	30.1	19.8	» »
25..	0.0	0.0	50.9 (49.56)	12.4 (12.44)	NaCl + »
25..	0.0	8.1	48.6	7.0	» »
25..	0.0	4.7	35.8	21.0	Na_2SO_4
25..	0.0	11.8	41.5	11.0	»

1.1.4 = astrakanite, $MgSO_4.Na_2SO_4 4H_2O$. The results in parentheses are by Blasdale, 1920.

Equilibrium in Aqueous Solutions Containing Magnesium Chloride and Various Other Salts.

Several exhaustive papers describing the hetereogeneous systems encountered in the technical production of particular salts from oceanic salt deposits have appeared in recent years. Among these should be mentioned those of Janecke, 1917, 1918, Serowy, 1923 and Frowein and von Mühlendahl, 1926. The experiments of Serowy are a repetition with great care, and an extension of the fundamental work of Van't Hoff, D'Ans and others. The compositions of the solutions saturated at regular intervals of temperature between 0° and 120° with all possible combinations of the solid phases, are shown in tables and triangular diagrams. The results are expressed in ion per cent of the constituents of the salts, Mg, K, Na, Cl and SO_4, and are also calculated to the molecular per cent and weight per cent basis and by the aid of density determinations, which are also given, to grams per liter. The paper of Janecke gives an exhaustive treatment of equilibria in hetereogeneous systems. That of Frowein and von Mühlendahl is concerned particularly with double ternary mixtures derived from Mg, K_2, Na_2 $(NO_3)_2$ and Cl_2.

100 gms. sat. solution of magnesium chloride in selenium oxychloride ($Se O Cl_2$) contain 4.96 gms. $Mg Cl_2$ at 25°. (Wise, 1923.)

Fusion-point data for mixtures of $Mg Cl_2 + K Cl$, $Mg Cl_2 + Na Cl$ and $Mg Cl_2 + KCl + Na Cl$ are given by Scholich, 1920.

MAGNESIUM CINNAMATE $Mg.C_{18}H_{14}O_4.4H_2O$.

100 cc. sat. solution of magnesium cinnamate in water contain 1.225 gm. $Mg C_{18}H_{14}O_4$ at 20°. (Ephraim and Pfister, 1925.)

MAGNESIUM ERUCATE $C_8H_{17}CH{:}CH(CH_2)_{11}COO\,Mg$.

Solubility of Magnesium Erucate in Aqueous Ethyl Alcohol at 25°. (Thomas and Mattikow, 1926.)

Wt. per cent C_2H_5OH.	d_4^{25} of Sat. sol.	Gms. $C_8H_{17}CH:CH(CH_2)_{11}.COOMg$ per 100 cc. sat. sol.	Gms. $C_8H_{17}CH:CH(CH_2)_{11}.COOMg$ per 100 gms. solvent.
0.0 (= H_2O)	—	0.006	0.006
18.13	0.9690	0.004	0.005
28.37	0.9535	0.007	0.008
45.67	0.9194	0.019	0.020
65.82	0.8734	0.142	0.171
75.40	0.8504	0.179	0.240
88.38	0.8177	0.268	0.349
94.28	0.8018	0.323	0.420

MAGNESIUM Ortho GERMANATE Mg_2GeO_4.

Solubility in Water and in Aqueous Solutions at 26°. (Müller, 1922.)

Solvent.	Gms. Mg_2GeO_4 per 100 cc. sat. sol.
Water	0.0016
3 vols. H_2O + 2 vols. NH_4OH	0.002
Aq. 10 % $(NH_4)_2SO_4$ + excess NH_4OH	0.013

MAGNESIUM HELIANTHATE $Mg(C_{14}H_{14}N_3SO_3)_2.4H_2O$.

100 cc. H_2O dissolve 0.035 gm. magnesium helianthate at 20-25°. (Stark and Dehn, 1918.)

MAGNESIUM HYDROXIDE $Mg(OH)_2$.

Solubility of Magnesium Hydroxide in Water at 18°.

A saturated solution prepared by agitating freshly ignited Mg O with conductivity water for 4 hours, taking greatest care to exclude CO_2, was found to contain 0.016 gm. Mg O per liter. This corresponds to 0.397 millimols Mg O or $Mg(OH)_2$ per liter. By conductometric measurements the solubility was found to be 0.348 millimols per liter and by conductivity titration, 0.39 millimols per liter. The value 0.2 millimol, of Kohlbranch is considered to be too low. (Remy and Kuhlmann, 1924.)

MAGNESIUM HYDROXIDE 1284

According to Gjalback, 1925, magnesium hydroxide exists in two well defined modifications of which the more easily soluble is the labil form and the more difficultly soluble is the stable form. The labil form is obtained by precipitating magnesium salts with bases, by hydration of magnesium oxide and by replacement between metallic magnesium and water. The stable magnesium hydroxide is formed from the labil. The change (recrystallization) goes quickly at high magnesium concentrations and slower at lower concentrations.

The following comparative results are reported. Temp. 18°.

Method.	Minimum Solubility (stable.)	Maximum Solubility (labil).
Direct solubility determination	$2.\ 2.10^{-4}$	$6.5.10^{-4}$
$Mg^{++} + 2NH_4OH \rightleftharpoons Mg(OH)_2 + 2NH_4^+$	$1.\ 9.10^{-4}$	$5.5.10^{-4}$
Conductivity method	$(1.35.10^{-4})$	$4.6.10^{-4}$
Electrometric method	$1.\ 6.10^{-4}$	$7.0.10^{-4}$

MAGNESIUM LIGNOCERATE.

100 gms. H_2O dissolve 0.002 gm. magnesium lignocerate at 25°.

100 gms. 44.13 per cent aq. alcohol dissolve 0.003 gm., and 100 gm. 91.53 per cent alcohol dissolve 0.006 gm. (Thomas and Yu, 1923.)

MAGNESIUM MALATE active, $C_4H_4O_5Mg.3H_2O$; racemic, $C_8H_8O_{10}Mg_2, 5H_2O$.

Solubility of Each Form in Water.

(Duboux and Cuttat, 1921.)

Active Salt.			Racemic Salt.		
t°.	Gms. $C_4H_4O_5.Mg$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $C_8H_8O_{10}.Mg_2$ per 100 gms sat. sol.	Solid Phase.
0.....	2.02	$C_4H_4O_5.Mg.3H_2O$	0.....	0.93	$C_8H_8O_{10}Mg_2.5H_2O$
12.5.....	2.28	»	12.5.....	1.08	»
25.0.....	2.54	»	25.0.....	1.23	»
37.5.....	2.80	»	37.5.....	1.38	»

Saturation was obtained by continuous rotation for 7 to 10 hours.

MAGNESIUM NITRATE $Mg(NO_3)_2.6H_2O$.

Solubility of Magnesium Nitrate at 25° in Aqueous Solutions of :

(Jackman and Browne, 1922.)

Magnesium Sulfate and Vice Versa.			Sodium Nitrate and Vice Versa.		
Gms. per 100 gms. sat. sol.		Solid Phase.	Gms. per 100 gms. sat. sol.		Solid Phase.
$Mg(NO_3)_2$.	$MgSO_4$.		$Mg(NO_3)_2$.	$NaNO_3$.	
43.25	0.0	$Mg(NO_3)_2.6H_2O$	40.84	3.37	$Mg(NO_3)_2.6H_2O$
40.76	1.02	»	40.00	5.12	»
40.15	2.77	»+$MgSO_4.7H_2O$	38.25	9.22	»+$NaNO_3$
37.75	3.09	$MgSO_4.7H_2O$	36.98	9.70	$NaNO_3$
35.07	3.62	»	26.90	17.00	»
32.22	4.18	»	16.12	28.39	»
25.90	6.56	»	12.60	32.93	»
15.56	12.53	»	9.82	36.58	»
8.88	17.85	»	4.35	42.56	»
0.00	26.30	»	0.00	47.60	»

MAGNESIUM OLEATE $(C_{17}H_{33}COO)_2Mg$.

Solutions prepared by rubbing magnesium oleate (prepared from technical sodium oleate) with water or salt solution and allowing to stand at room temperature for 36 hours, contained from 4.28 to 5.42 milligrams Mg per liter of water and 5.85 to 5.77 milligrams Mg per liter of 0.05 or 0.1 per cent aqueous Na Cl solution.

(Zink and Liere, 1915.)

Solutions prepared by heating a suspension of magnesium oleate in water or aqueous salt solution to the boiling point and allowing to cool, contained 50.6 parts Mg per liter of water, 99.89 parts Mg per liter of 0.1 per cent aq. Na Cl and 90.26 parts Mg per liter of 0.1 per cent aq. K Cl solution. (Haupt, 1914.)

100 gms. 63.07 wt. % aq. alcohol dissolve 4.60 gms. $(C_{17}H_{33}COO)_2Mg$ at 25°
» 72.17 » » » 6.64 » »
» 86.16 » » » 8.60 » »

(Thomas and Yu, 1923.)

MAGNESIUM OXALATE $MgC_2O_4.2H_2O$.

One liter of sat. solution of magnesium oxalate in water contains 0.32 gm. Mg C_2O_4 at 36° and 0.40 gm. at 92°. (Chatterjee and Dhar, 1924.)

MAGNESIUM PALMITATE $(C_{15}H_{31}COO)_2Mg$.

Solutions prepared by rubbing magnesium palmitate (prepared from pure sodium palmitate) with water or aqueous salt solution and allowing to stand at room temperature for 36 hours contained from 2.82 to 3.03 milligrams Mg per liter of water and 3.12 to 3.03 milligrams Mg per liter of 0.05 to 0.10 per cent aqueous Na Cl solution. (Zink and Liere, 1915.)

Solutions prepared by heating a suspension of magnesium palmitate in water or aqueous salt solution to the boiling point and allowing to cool, contained 55.68 parts Mg per liter of water, 92.21 parts Mg per liter of 0.1 per cent aq. Na Cl and 72.39 parts Mg per liter of 0.1 per cent aq. K Cl. (Haupt, 1914.)

MAGNESIUM *o* and *p* Xylol SELENATES.

Solubility of Each in Water.

(Anschütz, Kallen and Riepenkröger, 1919.)

Compound.	Formula.	t°.	Gms. anhydrous cmpd. per 100 gms. H_2O
Ortho compound...	$[C_6H_3(CH_3)_2(1.2)SeO_3(4)]_2Mg$	20	0.85
Para » ...	$[C_6H_3(CH_3)_2(1.4)SeO_3]_2Mg.8H_2O$	15	2.02

MAGNESIUM STEARATE $(C_{17}H_{35}COO)_2Mg$.

Solutions prepared by rubbing magnesium stearate (prepared from commercial sodium stearate) with water or salt solutions and allowed to stand at room temperature for 36 hours contained from 3.17 to 3.23 milligrams Mg per liter of water and 3.70 to 3.84 milligrams Mg per liter of 0.05 to 0.1 % aq. Na Cl. solution. (Zink and Liere, 1915.)

Solutions prepared by heating a suspension of magnesium stearate in water or aqueous salt solution to the boiling point and allowing to cool, contained 65.89 parts Mg per liter of H_2O, 95.79 parts Mg per liter of 0.1 % aq. Na Cl solution and 99.62 parts Mg per liter of 0.1 % aq. K Cl solution. (Haupt, 1914.)

Solubility of Magnesium Stearate in Aqueous Solutions of Ethyl Alcohol at 25°. (Thomas and Yu, 1923.)

Constant agitation was employed for obtaining saturation.

Wt. per cent C_2H_5OH in solvent.	d_4^{25} of sat. sol.	Gms. $(C_{17}H_{35}COO)_2Mg$ per 100 cc. sat. sol.	Gms. $(C_{17}H_{35}COO)_2Mg$ per 100 gms. solvent.
0.0 (= H_2O).....	0.99709	0.004	0.004
19.9.....	0.97122	0.004	0.004
27.29.....	0.95792	0.003	0.003
44.13.....	0.92275	0.003	0.003
63.07.....	0.87783	0.004	0.005
72.17.....	0.85821	0.005	0.006
86.16.....	0.82356	0.006	0.007
91.53.....	0.80935	0.006	0.007

MAGNESIUM SULFATE $MgSO_4.7H_2O$.

Solubility of Magnesium Sulfate in Aqueous Solutions of Potassium Sulfate at 30° and Vice Versa. (Weston, 1922.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$MgSO_4$.	K_2SO_4.	Solid Phase.	$MgSO_4$.	K_2SO_4.	Solid Phase.
29.03	0.0	$MgSO_4.7H_2O$	18.08	8.59	$MgSO_4.K_2SO_4.6H_2O$
27.69	3.21	Mixed Crystals	13.19	11.66	»
27.48	4.36	»	12.88	12.47	»
26.20	5.98	»	9.49	12.64	K_2SO_4
26.28	6.60	»	3.45	11.98	»
26.05	6.93	»	0.08	11.20	»

The author also gives data for the quaternary system $MgSO_4 + K_2SO_4 + (NH_4)_2SO_4 + H_2O$.

Equilibrium in the System Magnesium Sulfate, Potassium Sulfate and Water at Various Temperatures. (Levi, 1923.)

	Gms. per 100 gms. sat. sol.				Gms. per 100 gms. sat. sol.		
t°.	$MgSO_4$.	K_2SO_4.	Solid Phase.	t°.	$MgSO_4$.	K_2SO_4.	Solid Phase.
0.0...	21.09	3.42	$MgSO_4.12(?)H_2O$ + 1.1.6	34.4...	14.38	11.66	K_2SO_4 + 1.1.6
19.8...	25.34	3.83	$MgSO_4.7H_2O$ + »	44.7...	17.00	12.08	» + »
26.1...	26.45	4.26	» + »	49.6...	18.09	12.46	» + ?
37.8...	29.80	4.13	» + »	55.2...	18.38	12.86	» + 1.1.4
0....	8.73	7.86	K_2SO_4 + »	63.4...	17.20	14.35	» + »
20.4 ..	12.08	10.10	» + »				

1.1.6 = Schönite, $MgSO_4.K_2SO_4.6H_2O$; 1.1.4 = Leonite, $MgSO_4.K_2SO_4.4H_2O$.

The author considers that the results of Van der Heide are incorrect, due to incomplete saturation. The errors in the data of others are also pointed out.

Solubility of Magnesium Sulfate in Aqueous Solutions of Sodium Sulfate at 25° and Vice Versa. (Takegami, 1921.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$MgSO_4$.	Na_2SO_4.	Solid Phase.	$MgSO_4$.	Na_2SO_4.	Solid Phase.
26.68	0.00	$MgSO_4.7H_2O$	16.14	18.16	1.1.4
23.77	6.69	»	14.14	20.50	»
20.06	10.80	»	15.63	18.63	» + $Na_2SO_4.10H_2O$
19.84	26.54	»	17.67	18.16	$Na_2SO_4.10H_2O$
21.60	12.45	» + 1.1.4	10.93	19.17	»
19.46	14.13	1.1.4	10.78	18.85	»
18.28	15.89	»	3.34	20.88	»
16.31	18.22	»	0.00	21.54	»

1.1.4 = Astrakanite, $MgSO_4.Na_2SO_4.4H_2O$.

Solubility of Magnesium Sulfate Octahydrate in Aqueous Solutions of Sodium Sulfate at 25° and at 30°. (Takegami, 1921 *a*, 1922.)

Results at 25°.

Gms. per 100 gms. sat. sol.		
$MgSO_4$.	Na_2SO_4.	Solid Phase.
26.68	0.00	$MgSO_4.8H_2O$
25.48	2.73	»
25.04	3.54	»
24.49	5.20	»
23.49	7.50	»
22.32	10.10	»
21 27	12.76	»

Results at 30°.

Gms. per 100 gms. sat. sol.		
$MgSO_4$.	Na_2SO_4.	Solid Phase.
29.00	0.00	$MgSO_4.8H_2O$
26.35	3.96	»
24.35	8.43	»
22.89	11.80	»
23.00	12.49	» + $MgSO_4.7H_2O$
22.33	13.71	$MgSO_4.7H_2O$
21.92	14.47	»

The tr. temp. of the 8 H_2O to 7 H_2O is at 45°.5-46°.1 in sodium sulfate solutions of 7 to 9 per cent concentration.

EQUILIBRIUM IN THE SYSTEM MAGNESIUM SULFATE, SODIUM SULFATE AND WATER AT VARIOUS TEMPERATURES. (Archibald and Gale, 1924.)

t°.	Gms. per 100 gms. sat. sol. $MgSO_4$.	Gms. per 100 gms. sat. sol. Na_2SO_4.	Solid Phase.
0..	(20.63)	0.0	$MgSO_4.7H_2O$
0..	20.0	0.0	$MgSO_4.12H_2O$
0..	20.0	4.3	» (?)
0..	20.0	4.63	$MgSO_4.7H_2O+Na_2SO_4.10H_2O$
0..	(19.66)	(3.92)	»
0..	11.25	4.69	$Na_2SO_4.10H_2O$
0..	9.65	4.89	»
10..	20.9	7.46	$MgSO_4.7H_2O+Na_2SO_4.10H_2O$
10..	19.4	7.4	$Na_2SO_4.10H_2O$
10..	0.75	8.3	»
18.7.	25.7	0.5	$MgSO_4.7H_2O$
18.7.	24.4	3.4	»
18.7.	20.60	11.48	»
18.7.	20.57	11.80	$»+Na_2SO_4.10H_2O$
18.7.	15.70	12.30	$Na_2SO_4.10H_2O$
18.7.	11.30	13.50	»
18.7.	8.92	13.90	»
18.7.	1.48	14.68	»
25..	(28.04)	0.00	$MgSO_4.7H_2O$
25..	22.6	10.8	»
25..	19.8	16.9	$»+Na_2SO_4.10H_2O$*
25..	21.15	13.0	» +1.1.4
25..	(19.86)	(14.54)	» »
25..	16.6	17.8	$Na_2SO_4.10H_2O$+1.1.4
25..	(15.88)	(18.52)	» »
25..	0.25	21.2	$Na_2SO_4.10H_2O$
25..	0.0	(21.87)	»
30..	24.55	8.75	$MgSO_4.7H_2O$
30..	24.5	9.27	»
30..	23.25	12.35	» +1.1.4
30..	15.8	18.6	1.1.4
30..	12.3	23.25	» $+Na_2SO_4.10H_2O$
30..	6.48	26.08	$Na_2SO_4.10H_2O$
40..	28.0	8.5	$MgSO_47H_2O$+1.1.4
40..	25.1	9.6	1.1.4
40..	24.1	10.8	»
40..	20.95	13.8	»
40..	15.35	19.15	»
40..	13.15	22.80	»
40..	12.2	23.2	»
40..	11.6	24.5	» $+Na_2SO_4$
40..	11.0	24.7	Na_2SO_4
40..	3.61	30.7	»
40..	2.54	30.70	»
50..	32.8	2.51	$MgSO_4.6H_2O$
50..	31.3	5.7	» +1.1.4
50..	30.45	6.15	1.1.4
50..	27.8	9.75	»
50..	18.2	16.0	»
50..	16.0	18.3	»
50..	14.1	21.8	»
50..	13.7	23.8	$» +MgSO_4.3Na_2SO_4$
50..	12.7	25.0	$» +Na_2SO_4$
50..	9.65	26.85	Na_2SO_4
50..	2.6	30.0	»
60..	34.5	1.92	$MgSO_4.6H_2O$
60..	33.8	3.55	»
60..	33.8	4.6	» +1.1.4
60..	30.0	6.5	1.1.4
60..	23.1	12.0	»
60..	18.2	15.8	»
60..	14.0	21.8	»
60..	9.9	24.85	Na_2SO_4
60..	6.05	27.85	»
80..	38.4	2.8	$MgSO_4.H_2O$
80..	36.3	4.9	$MgSO_4.Na_2SO_4.^5/_2H_2O$
80..	33.25	6.35	»
80..	24.06	12.6	»
80..	18.1	17.85	»
80..	16.4	19.7	»
80..	15.4	21.4	»
80..	14.7	22.0	»
80..	14.55	22.3	$» +MgSO_4.3Na_2SO_4$
80..	14.2	22.25	$MgSO_4.3Na_2SO_4$
80..	13.85	22.55	»
80..	4.29	28.1	$» (?)+Na_2SO_4$
80..	0.0	30.4	Na_2SO_4
100..	42.5	0.0	$MgSO_4.6H_2O$*
100..	40.6	0.0	$MgSO_4H_2O$
100..	32.0	6.07	$MgSO_4.Na_2SO_4.^5/_2H_2O$
100..	31.1	6.5	»
100..	23.2	12.55	»
100..	16.9	19.4	$» (?) +MgSO_4.3Na_2SO_4$
100..	13.75	20.6	$MgSO_4.3Na_2SO_4$
100..	13.7	20.5	»
100..	0.0	29.8	Na_2SO_4

* Indicates unstable equilibrium.

1.1.4 = Astrakanite $MgSO_4.Na_2SO_4.4H_2O$.

The results in parentheses are by Kournakow and Zemcuznyj, 1919, 1924.

Determinations of the solubilities of the single salts and miscellaneous determinations at other temperatures were taken by the authors from the literature. They will be found under their respective headings in the present compilation.

Freezing-point data for mixtures of magnesium sulfate and sulfuric acid are given by Kendall and Davison, 1921.

MAGNESIUM Anthracene, Benzene and Naphthalene SULFONATES.

Solubility of Each in Water.
(Ephraim and Pfister, 1925, 1925 *a*; Ephraim and Seger, 1925.)

Compound.	Formula.	t°.	Gms. anhydrous cmpd. per 100 cc. sat. sol.
Magnesium Anthracene-1-sulfonate...	$Mg(C_{14}H_9SO_3)_2.4H_2O$	20....	0.0799
» » -2- » ...	$Mg(C_{14}H_9SO_3)_2.4H_2O$	20....	0.0077
» Benzene sulfonate.....	$Mg(C_6H_5SO_3)_2.6H_2O$	17....	7.496
» » »	»	20....	7.639
» » »	»	36....	11.153
» » »	»	50....	14.569
» » »	»	65....	20.420
» » »	»	80.5..	26.045
» » »	»	82.0..	26.804
» Naphthalene-1-sulfonate..	$Mg(C_{10}H_7SO_3)_2.6H_2O$	17....	6.978
» » -2- » ..	$Mg(C_{10}H_7SO_3)_2.4H_2O$	16.5..	0.2
» » -2- » ..	$Mg(C_{10}H_7SO_3)_2.6H_2O$	20.0..	0.223
» » » » ..	»	32	0.373
» » » » ..	»	45	0.490
» » » » ..	»	59	0.790
» » » » ..	»	74	1.336
» » » » ..	»	82	1.737
» »-6 oxy-2-sulfonate..	$Mg(C_{10}H_7SO_3)_2.8H_2O$	20	0.964

MAGNESIUM Naphthylamine Di SULFONATES $MgC_{10}H_5(NH_2)(SO_3)_2$, 2.6.8 and 2.5.7.

100 gms. sat. sol. of the 2.6.8 cmpd. in water contain 8.7 gms. $MgC_{10}H_5(NH_2)(SO_3)_2$ at 15°.
100 gms. sat. sol. of the 2.5.7 cmpd. in water contain 21.09 gms. $MgC_{10}H_5(NH_2)(SO_3)_2$ at 15°.
(Braunschweig, 1922, 1926.)

MAGNESIUM TARTRATE $Mg(C_4H_4O_6).2\frac{1}{2}H_2O$.

100 cc. of sat. solution of $Mg(C_4H_4O_6).2\frac{1}{2}H_2O$ in water contain 0.76 gm. $Mg(C_4H_4O_6)$ at 30° and 1.44 gm. at 90°. (Chatterjee and Dhar, 1924.)

Solubility of Active Magnesium Tartrate and of Racemic Magnesium Tartrate in Water at Several Temperatures.
(Duboux and Cuttat, 1921.)

Results for the Active Solt.

t°.	Gms. $MgC_4H_4O_6$ per 100 gms. sat. sol.	Solid Phase.
0.....	0.540	$MgC_4H_4O_6.4H_2O$
12.5...	0.848	»
25.....	1.174	»
26.2...	1.220	»+$MgC_4H_4O_6.2H_2O$
37.5...	1.050	$MgC_4H_4O_6.2H_2O$

Results for the Racemic Salt.

t°.	Gms. $Mg_2C_8H_8O_{12}$ per 100 gms. sat. sol.	Solid Phase.
0.....	0.403	$Mg_2C_8H_8O_{12}.10H_2O$
12.5...	0.582	»
25.0...	0.826	»
37.5...	1.095	»

MAGNESIUM Di THIONATE $MgS_2O_6.6H_2O$.

Solubility of Magnesium Dithionate in Water. (de Baat, 1926.)

t°.....	0°.	12°.	20°.	30°.
Gms. MgS_2O_6 per 100 gms. sat. sol.....	31.94	33.30	33.91	35.24

MALEIC ANHYDRIDE $C_4H_2O_3$.

100 cc. xylene dissolve 16.32 gms. maleic anhydride at 29°.7.
100 cc. coal tar heavy solvent dissolve 9.04 gms. maleic anhydride at 29°.7.
(Weiss and Downs, 1923.)

MALEIC DIAMIDE $C_4H_2O_2(NH_2)_2$.

100 cc. H_2O dissolve 0.248 gm. maleic diamide at 50°. (Viseur, 1926.)

MALEIC ACID COOH.CH:CH.COOH (see also p. 1215).

DISTRIBUTION OF MALEIC ACID AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Ethyl Ether.

Millimols. COOH.CH:CH.COOH per liter of H_2O layer (C_1).	Millimols. COOH.CH:CH.COOH per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
1.56	0.215	0.138
2.50	0.35	0.140
4.85	0.75	0.153
7.25	1.025	0.141
11.45	1.90	0.166

Acetone and Glycerol.

Millimols. COOH.CH:CH.COOH per liter of Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
0.4375	1.925	0.454
0.95	1.50	0.380
1.75	3.285	0.454
3.50	7.40	0.473
6.85	13.05	0.525

MALIC ACID *i* COOH.CH_2.CHOH.COOH.

SOLUBILITY OF INACTIVE MALIC ACID IN WATER. (Weiss and Downs, 1923.)

t°.	Gms. *i* COOH.CH_2.CHOH.COOH per 100 gms. of Water.	Sat. solution.
26.....	144.8	59.15
50.....	222.0	68.95
60.....	268.4	72.85
70.....	332.0	76.85
79.....	411.5	80.65

DISTRIBUTION OF MALIC ACID AT 25° BETWEEN ACETONE AND GLYCEROL. (Smith, 1921, 1922.)

Millimols. COOH.CH_2.CHOH.COOH per liter of Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$
0.475	2.60	0.182
0.675	3.75	0.180
1.10	5.50	0.200
2.2875	11.0625	0.207

MALONIC ACID $CH_2(COOH)_2$.

SOLUBILITY OF MALONIC ACID AT 25° IN AQUEOUS SOLUTIONS OF : (Knox and Richards, 1919.)

Hydrochloric Acid.

Equiv. normality of HCl.	$CH_2(COOH)_2$.
0.0	15.01
4.443	7.70
6.210	5.99
8.658	4.71
10.47	4.32
11.09	4.26
11.22	4.30

Sulfuric Acid.

Equiv. normality of H_2SO_4.	$CH_2(COOH)_2$.
0.0	15.01
2.727	11.44
7.050	6.79
11.76	4.07
16.05	3.01
19.92	3.20
21.84	4.55

DISTRIBUTION OF MALONIC ACID AT 25° BETWEEN : (Smith, 1921, 1922).

Water and Ethyl Ether.

Millimols. $CH_2(COOH)_2$ per liter of H_2O layer (C_1).	Millimols. $CH_2(COOH)_2$ per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
2.1875	0.29375	0.134
3.80	0.5125	0.135
7.90	1.05	0.133
22.30	3.44	0.154
34.42	5.17	0.150
94.60	14.00	0.148

Acetone and Glycerol.

Millimols. $CH_2(COOH)_2$ per liter of Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
0.475	1.20	0.396
1.05	2.4875	0.423
1.8875	3.775	0.500
2.80	6.05	0.462
6.05	14.0	0.433

MALTOSE $C_{12}H_{22}O_{11} + H_2O$ (See also Sugars p. 1457-1458)).

Solubility of Maltose in Water.

(Gillis, 1924.)

t°.	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. Water.	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. Sat. sol.	Solid Phase.	t°.	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. Water.	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. Sat. sol.	Solid Phase.
— 0.79...	–	12.23	Ice	43.5.....	123.9	55.3	$C_{12}H_{22}O_{11}.H_2O$
— 1.16...	–	16.67	»	49.4.....	137.0	57.8	»
— 1.87...	–	23.97	»	49.4.....	142.7	58.8	»
+ 0.6....	55.7	35.8	$C_{12}H_{22}O_{11}.H_2O$	54.2.....	151.4	60.2	»
+ 0.6....	57.3	36.4	»	59.8.....	175.2	63.7	»
21.0....	78.6	44.0	»	66.3.....	200.0	66.7	»
21.0....	79.2	44.2	»	74.2.....	261.5	72.3	»
29.6....	93.2	48.0	»	87.0.....	383.8	79.3	»
34.4....	98.4	49.6	»	96.5.....	569.3	85.1	»

The determinations above 50° were made by the synthetic method. The temperature of disappearance of the last crystal was determined.

Several determinations of the freezing-point of solutions of maltose in 0.1 *n* ammonia gave the following results.

t°.....	−1.17.	−1.25.	−1.91.	−2.41.
Gms. $C_{12}H_{22}O_{11}$ per 100 gms. sat. sol...	16.9	18.3	25.05	28.87

MANDELIC ACID $C_6H_5.CHOH.COOH$.

100 cc. sat. sol. of Mandelic acid in H_2O contain 12.65 gms. $C_6H_5CHOH.COOH$ at 19°
» » » C_6H_6 » 0.0746 » »

(Schilow and Lepin, 1922.)

Solubility of Mandelic Acid at 25° in Aqueous Solutions of :

(Knox and Richards, 1919.)

Acetic Acid. Equiv. Normality of CH_3COOH.	Acetic Acid. Equiv. Normality of $C_8H_8O_3$.	Formic Acid. Equiv. Normality of HCOOH.	Formic Acid. Equiv. Normality of $C_8H_8O_3$.	Hydrochloric Acid. Equiv. Normality of HCl.	Hydrochloric Acid. Equiv. Normality of $C_8H_8O_3$.	Sulfuric Acid. Equiv. Normality of H_2SO_4.	Sulfuric Acid. Equiv. Normality of $C_8H_8O_3$.
0.870	1.808	0.0	1.191	0.0	1.191	0.00	1.191
1.338	2.312	2.268	1.768	1.202	0.691	2.695	0.484
1.860	2.664	4.340	2.180	2.481	0.488	5.390	0.278
2.618	3.186	6.320	2.380	3.753	0.387	8.294	0.186
3.644	3.444	8.09	2.430	5.017	0.339	11.05	0.180
4.249	3.472	10.38	2.434	6.271	0.307	13.62	0.180
4.738	3.487	12.20	2.525	7.523	0.302	16.5	0.16
6.485	3.509	13.41	2.750	8.748	0.316	18.89	0.23
8.60	3.234	13.78	3.327	9.937	0.353	21.17	0.27
9.85	2.996			10.35	0.375		
12.30	2.178						

Distribution of Mandelic Acid at 19° Between :

(Schilow and Lepin, 1922.)

Water and Benzene. Gms. $C_6H_5CHOH.COOH$ per 100 cc. H_2O layer (C_1).	C_6H_6 layer (C_2).	$\frac{C_1}{C_2}$.	Water and Anisole. Gms. $C_6H_5CHOH.COOH$ per 100 cc. H_2O layer (C_1).	Anisole layer (C_2).	$\frac{C_1}{C_2}$.
1.46	0.0165	89	1.05	0.189	5.6
2.99	0.0336	89	1.383	0.258	5.4
4.22	0.0468	90	4.00	0.752	5.3
6.74*	0.0746*	90	4.56	0.852	5.4
			6.325	1.178	5.4
			7.16*	1.325*	5.4

*Excess mandelic acid present.

DISTRIBUTION OF MANDELIC ACID AT 25° BETWEEN :
(Smith, 1921, 1922.)

Water and Ethyl Ether.			Acetone and Glycerol.		
Millimols. $C_6H_5CHOH.COOH$ per liter of			Millimols. $C_6H_5CHOH.COOH$ per liter of		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer C_2.	$\frac{C_2}{C_1}$.	Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
0.885	1.175	1.330	4.225	2.075	2.04
1.070	1.475	1.380	8.65	4.25	2.04
2.100	2.95	1.405	16.45	8.25	1.99
3.225	4.825	1.495	23.0	11.6	1.98
5.225	8.525	1.63			

MANGANESE ACETATE $Mn(CH_3COO)_2.4H_2O$.

100 gms. H_2O dissolve 64.5 gms. $Mn(CH_3COO)_2.4H_2O$ at 5°. The determination was made by adding water gradually to a weighed amount of the pure compound untill the last few remaining fragments of crystals just disappeared.
(Cadenhead and Vining, 1924.)

MANGANESE BENZOATE $Mn(C_6H_5COO)_2.2H_2O$.

MANGANESE Chlor, Oxy, etc. **BENZOATES.**

SOLUBILITY OF EACH SEPARATELY IN WATER AT 20°.
(Ephraim and Pfister, 1925.)

Compound.	Formula.	Gms. anhydrous cmpd. per 100 cc. sat. sol.
Manganese Benzoate.....	$Mn(C_6H_5COO)_2.2H_2O$	4.82
» -4 Chlor Benzoate..	$Mn(C_6H_4.Cl.COO)_2.2H_2O$	1.157
» -4 Oxy » ..	$Mn(C_6H_4.OH.COO)_2.8H_2O$	3.324
» -4 Methoxy » ..	$Mn(C_6H_4.OCH_3.COO)_2.3H_2O$	1.452
» -4 Nitro » ..	$Mn(C_6H_4.NO_2.COO)_2.6H_2O$	1.341

MANGANESE CARBONATE $MnCO_3$.

100 gms. of a sat. solution of $MnCO_3$ in water at 18° and in contact with CO_2 at a pressure of 1 atmosphere contain 0.04 gm. $MnCO_3$. At a pressure of 56 atmospheres 0.080 gm. is dissolved. (Haehnel, 1924.)

MANGANESE CHLORIDE $MnCl_2$.

100 gms. sat. solution of manganese chloride in selenium oxychloride ($SeOCl_2$) contain 0.16 gm. $MnCl_2$ at 25°. (Wise, 1923.)

100 gms. pyridine dissolve 1.28 gms. $MnCl_2$ at 0° and 1.06 gms. at 25°.
(Müller, R., 1924.)

MANGANESE CINNAMATE $MnC_{18}H_{14}O_4.2H_2O$.

100 cc. sat. sol. of manganese cinnamate in water contain 0.214 gm. $Mn C_{18} H_{14} O_4$ at 20°. (Ephraim and Pfister, 1925.)

MANGANESE FUMARATE $MnC_4H_2O_4$.

100 gms. H_2O dissolve 0.14 gm. $MnC_4H_2O_4$ at 30°. (Weiss and Downs, 1923.)

MANGANESE HELIANTHATE $(C_{14}H_{14}N_3SO_3)_2.4H_2O$.

1000 cc. H_2O dissolve 0.06 gm. of the salt at 20-25°. (Stark and Dehn, 1918.)

MANGANESE HYDROXIDE $MnO(OH)_2$.

One liter ordinary distilled water containing a little CO_2 dissolves 0.00043 gm. $MnO(OH)_2$ at about 22°. (Almkvist, 1918.)

MANGANESE OXALATE $MnC_2O_4.2H_2O$ and $3H_2O$.

Solubility of Each of the Hydrates Separately in Water.
(Chamberlain, Hume and Topley, 1926.)

Saturation was secured by constant stirring in a thermostat. The trihydrate changes gradually to the dihydrate. The error due to this change was very slight. The results in parentheses are by Chatterjee and Dhar, 1924.

Results for the Dihydrate.

t°.	Gms. MnC_2O_4 per 100 gms. sat. sol.	Solid Phase.
0.0..	0.0198	$MnC_2O_4.2H_2O$
6.3..	0.0225	»
12.8..	0.0256	»
20.1..	0.0285	»
25.0..	0.0308	»
30.3..	0.0335	»
36.0..	0.0369 (0.0375)	»

Results for the Trihydrate.

t°.	Gms. MnC_2O_4 per 100 gms. sat. sol.	Solid Phase.
0.0...	0.0326	$MnC_2O_4.3H_2O$
6.3...	0.0388	»
12.8...	0.0476	»
20.1. .	0.0582	»
25.0...	0.0669	»
30.0...	0.0769	»
93.0...	(0.0780)	$MnC_2O_4.2H_2O$

MANGANESE SULFATE $MnSO_4.4H_2O$.

Solubility of Manganese Sulfate in Aqueous Solutions of Potassium Sulfate at 25° and Vice Versa. (Caven and Johnston, 1926.)

Gms. per 100 gms. sat. sol.		Solid Phase.	Gms. per 100 gms. sat. sol.		Solid Phase.
$MnSO_4$.	K_2SO_4.		$MnSO_4$.	K_2SO_4.	
39.10	0.0	$MnSO_4.4H_2O$	35.58	4.30	1.1.4
39.03	0.43	»	30.47	5.27	»
38.54	1.87	»	19.27	10.06	»
38.42	2.46	»	16.58	12.31	» $+K_2SO_4$
38.21	3.03	»	15.22	12.04	K_2SO_4
37.92	4.15	» $+1.1.4$	6.36	11.27	»
37.28	4.20	1.1.4	0.00	12.59	»

1.1.4 = $MnSO_4.K_2SO_4.4H_2O$.

MANGANESE Anthracene, Benzene and Naphthalene SULFONATES.

Solubility of Each Separately in Water.
(Ephraim and Pfister, 1925, 1925*a*; Ephraim and Seger, 1925.)

Compound.	Formula.	t°.	Gms. anhydrous cmpd. per 100 cc. sat. sol.
Manganese Anthracene-1-sulfonate.....	$Mn(C_{14}H_9SO_3)_2.6H_2O$	20	0.0477
» » -2- »	$Mn(C_{14}H_9SO_3)_2.6H_2O$	20	0.00575
» Benzene sulfonate.....	$Mn(C_6H_5SO_3)_2.6H_2O$	18	13.998
» » »	»	20	16.348
» » »	»	34	18.840
» » »	»	49.5	24.696
» » »	»	64.5	32.215
» » »	»	80.5	42.924
» Naphthalene-1-sulfonate.....	$Mn(C_{10}H_7SO_3)_2.6H_2O$	17.0	0.479
» » -2- »	$Mn(C_{10}H_7SO_3)_2.6H_2O$	16.5	0.334
» » » »	»	20	0.384
» » » »	»	32	0.532
» » » »	»	45	0.816
» » » »	»	59	1.359
» » » »	»	70.5	1.946
» » » »	»	74	2.186
» » » »	»	77	2.382
» » » »	»	81.5	2.859
» » -5-chlor-1-sulfonate.	$Mn(C_{10}H_6SO_3Cl)_2.H_2O$	20	0.742
» » -6- oxy -2- » .	$Mn(C_{10}H_7SO_3)_2.8H_2O$	20	1.200

MANGANESE SULFIDE MnS.

Purified manganese sulfide was agitated in 0.01 $n H_2SO_4$ containing H_2S for 10 hours at 20°. The determination was repeated after another period of 10 hours. The sat. solution contained 0.4874 gm. Mn S, corresponding to $5.6.10^{-3}$ gm. mols. MnS, per 1000 cc. (Moser and Behr, 1924.)

MANNITOL $CH_2OH(CHOH)_4CH_2OH$ (See also Sugars p. 1457-1458).

Solubility of Mannitol in Water. (Braham, 1919.)

The determinations were made with the greatest care. The results were plotted on a large scale diagram and the following values for regular intervals of temperature were obtained.

t°.	Gms. $CH_2OH(CHOH)_4CH_2OH$ per 100 gms. H_2O.	Mol. fraction Mannitol in solution.	t°.	Gms. $CH_2OH(CHOH)_4CH_2OH$ per 100 gms. H_2O.	Mol. fraction Mannitol in solution.
— 1.019 (Eutec.)	9.942	0.0097	40.0	34.6	0.0331
0.0	10.36	0.0101	50.0	47.6	0.0450
5.0	11.9	0.0117	60.0	64.4	0.0598
10.0	13.7	0.0134	70.0	86.2	0.0785
15.0	16.0	0.0156	80.0	115.0	0.1019
20.0	18.6	0.0181	90.0	150.0	0.1294
25.0	21.6	0.0209	100.0	197.0	0.1633
30.0	25.2	0.0243			

Solubility of Mannitol in Aqueous Alcohol Solutions at Different Temperatures. (Creighton and Klauder, Jr, 1923.)

Constant agitation in a thermostat was employed and equilibrium was approached both from above and below. The m. pt. of the mannitol was 165°.9.

	Gms. $CH_2OH(CHOH)_4CH_2OH$ per 100 gms. aq. Alcohol of					
t°.	0.0 Wt. % C_2H_5OH (= H_2O).	20 Wt. % C_2H_5OH.	40 Wt. % C_2H_5OH.	60 Wt. % C_2H_5OH.	80 Wt. % C_2H_5OH.	100 Wt. % C_2H_5OH.
0	10.2	4.83	1.81	0.79	0.16	0.003
15	16.4	8.53	3.49	1.33	0.25	0.010
25	21.3	11.62	5.48	2.25	0.55	0.030
35	29.6	16.74	8.60	3.62	0.80	0.075
50	47.2	30.18	16.76	6.92	1.58	0.28
60	61.14	41.23	26.50	12.36	4.08	0.81

MECONIC ACID $C_7H_4O_7.3H_2O$.

100 cc. sat. sol. of { Water contain 0.84 gm. $C_7H_4O_7$ at 25°.
Meconic acid in { Aq. 0.5 mol. H_3BO_3 solution contain 1.0 gm. $C_7H_4O_7$ at 25°.
(Verkade, 1924.)

MENTHENON $CH_3.CH\langle \begin{matrix} CO.CH \\ CH_2.CH_2 \end{matrix} \rangle C.CH(CH_3)_2$.

MENTHOL $(CH_3)_2CH.CH\langle \begin{matrix} CH(OH)CH_2 \\ CH_2CH_2 \end{matrix} \rangle CH.CH_3$.

MENTHON $(CH_3)_2CH.CH\langle \begin{matrix} CO.CH_2 \\ CH_2.CH_2 \end{matrix} \rangle CH.CH_3$.

Solubility of Each in Water at Room Temperature. (Rhode, 1922.)

The author used a stalogmometric method, according to which the number of drops per unit of time in the case of saturated solutions and their dilutions were compared with similar determinations upon a series of solutions of known content. For obtaining saturation long periods of shaking were often necessary.

Compound.	Per liter of sat. sol. Grams.	Millimols.
Menthenon	—	15.1
Menthol	0.42	2.7
Menthon	0.69	4.5

Freezing-point data for mixtures of menthol and sarcosine anhydride are given by Pfeiffer and Angern, 1926.

MERCURY ACETATE (ic) $Hg(CH_3COO)_2$.

Solubility of Mercuric Acetate in Mixtures of Phenol and Acetic Acid at 15°. (Mameli and Cocconi, 1922.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$Hg(CH_3COO)_2$.	C_6H_5OH.	CH_3COOH.	$Hg(CH_3COO)_2$.	C_6H_5OH.	CH_3COOH.
34.03	51.93	14.04	35.46	52.82	11.72
40.08	51.90	8.02	8.61	18.65	72.74
7.40	8.40	84.20	9.23	34.99	55.78
42.02	52.20	5.78	13.56	43.76	42.68
9.65	19.46	70.89	28.53	50.76	20.71

Data for the f. pt. of $Hg(CH_3COO)_2 + C_6H_5OH$ and other mixtures are also given by Mameli and Cocconi.

MERCURY ACETATE (ous) $Hg_2(CH_3COO)_2$.

Solubility of Mercurous Acetate in Water and in Aqueous Acetic Acid at 21°. (Legerlotz, 1918.)

Recrystallized mercurous acetate was rubbed with water or aqueous acetic acid untill thoroughly wet and the mixture constantly shaken in a thermostat for 120 hours. The saturated solution was analyzed by adding a slight excess of Na Cl to precipitate Hg Cl and this latter filtered, dried and weighed.

Solvent.	Gms. $Hg_2(CH_3COO)_2$ per 100 cc. sat. sol.
Water	0.1024
Aq. acetic acid (conc. = 2)	0.0730
» (conc. = 4)	0.0690
» (conc. = 6)	0.0650

The amount of acetic acid corresponding to conc. 2, 4 and 6 is not stated.

MERCURY BENZOATE (ic) $Hg(C_6H_5COO)_2.H_2O$.

100 cc. of sat. sol. of mercuric benzoate in water contain 0.209 gm. $Hg(C_6H_5COO)_2$ at 20°. (Ephraim and Pfister, 1925.)

MERCURY BROMATE (ic) normal $Hg(BrO_3)_2$, basic $HgOHBrO_3$.

Solubility of Each in Aqueous Solutions of Perchloric Acid and of Nitric Acid at 25°. (Smith, 1924.)

Results for $Hg(BrO_3)_2$ in Aq:

Perchloric Acid.		Nitric Acid.	
Approx. Normality of $HClO_4$.	Gms. $Hg(BrO_3)_2$ per 100 cc. sat. sol.	Approx. Normality of HNO_3.	Gms. $Hg(BrO_3)_2$ per 100 cc. sat. sol.
2.0	6.58	2.0	14.66
2.5	5.22	3.0	15.00
3.0	4.13	4.0	14.99
3.5	3.40	5.0	14.75
4.0	2.58		
5.0	1.55		

Results for $HgOHBrO_3$ in Aq:

Perchloric Acid.		Nitric Acid.	
Approx. Normality of $HClO_4$.	Gms. $HgOHBrO_3$ per 100 cc. sat. sol.	Approx. Normality of HNO_3.	Gms. $HgOHBrO_3$ per 100 cc. sat. sol.
0.0 (= H_2O)	0.081	1.0	12.52
1.0	4.34	2.0	21.30
2.0	5.94		
2.5	6.06		
3.0	6.06		

MERCURY BROMIDE (ic) $HgBr_2$.

Solubility of Mercuric Bromide in Water and in Aqueous Solutions of Glycerol at 25°. (Moles and Marquina, 1924.)

Solvent.	d_4^{25} of sat. sol.	Gms. $HgBr_2$ per 100 gms. solvent.
Water	1.0023	0.6135
Aq. 25.0 % glycerol	1.0651	0.9840
» 75.2 »	1.2204	3.456
» 99.2 »	1.4000	15.687

Fusion-point data for mixtures of $HgBr_2 + HgI_2$, $HgBr_2 + HgCl_2$ and $HgBr_2 + HgCl_2 + HgI_2$ are given by Losana, 1926. Results for mixtures f $HgBr_2 + Tl NO_3$ and $HgBr_2 + Ag NO_3$ are given by Bergman, 1922-1924, 1926; and Bergman, Genke and Isaikin, 1922-1924.

MERCURY BROMIDE (ous) Hg_2Br_2.

The solubility product of mercurous bromide, determined by a modified electrometric method, was found by Brodsky and Scherschewer, 1926, to be $2.7.10^{-23}$ at 19° and $5.7.10^{-23}$ at 26°.5.

MERCURY CHLORIDE (ic) $HgCl_2$.

Solubility of Mercuric Chloride in Water.

t°.	d of sat. sol.	Gms. $HgCl_2$ per 100 gms. sat. sol.	t°.	d of sat. sol.	Gms. $HgCl_2$ per 100 gms. sat. sol.
18.....	–	6.24 (1)	56.....	1.109	13.7 (3)
25.....	–	6.76 (2)	80.....	1.194	23.4 (3)
34.....	1.068	8.55 (3) (4)	100.....	1.348	36.0 (3)

(1) Laird, 1920; (2) Moles and Marquina, 1914, 1924; (3) Tourneux, 1919; (4) Toda, 1921.

Equilibrium in the System Mercuric Chloride, Yellow Mercuric Oxide and Water at 35°. (Toda, 1921.)

The various mixtures were rotated in a thermostat for about 72 hours, and both the clear solution and solid phases were analyzed.

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$HgCl_2$.	HgO.	Solid Phase.	$HgCl_2$.	HgO.	Solid Phase.
8.58	0.0	$HgCl_2$	0.61	0.02	$HgCl_2.4HgO$
8.72	0.14	»+$HgCl_2.2HgO$	0.23	0.03	»
8.68	0.07	» »	0.20	0.06	»
8.69	0.10	» »	0.13	0.04	»+HgO
8.81	0.03	» »	0.07	0.04	» »
8.70	0.11	» »	0.05	0.03	» »
8.69	0.10	» »	0.05	0.04	» »
4.39	0.09	$HgCl_2.2HgO$	0.04	0.04	HgO
3.42	0.06	»	0.01	0.03	»
0.66	0.02	»	0.00	0.001	»
0.66	0.02	»+$HgCl_2.4HgO$			

Equilibrium in the System Mercuric Chloride, Potassium Chloride, and Water at 34°. (Tourneux, 1919.)

Saturation was secured by constant stirring. Both the saturated solutions and solid phases were analyzed.

	Gms. per 100 gms. sat. sol.				Gms. per 100 gms. sat. sol.		
d of sat. sol.	$HgCl_2$.	KCl.	Solid Phase.	d of sat. sol.	$HgCl_2$.	KCl.	Solid Phase.
1.068	8.55	0 0	$HgCl_2$	1.386	27.9	9.6	$HgCl_2.KCl.^3/_4H_2O$
1.202	19.14	2.6	»	1.368	25.5	11.4	»
–	27.2	4.2	»	1.428	26.8	14.9	»
–	34.1	5.4	»	1.561	30.8	20.0	»
1.497	37.0	6.0	»	1.620	32.6	22.0	»
1.512	37.4	6.0	»+$2HgCl_2.KCl.2H_2O$	1.624	33.0	21.9	»+$HgCl_2.2KCl.H_2O$
1.525	37.8	6.5	$2HgCl_2.KCl.2H_2O$	1.621	32.8	21.9	$HgCl_2.2KCl.H_2O$
1.533	37.7	6.7	»	–	29.0	23.0	»
1.545	37.6	7.3	»	–	24.5	24.8	»
1.549	37.8	7.45	»+$3HgCl_2.2KCl.^5/_3H_2O$	1.459	20.65	26.0	»+KCl
1.534	37.4	7.8	$3HgCl_2.2KCl.^5/_3H_2O$	–	17.8	26.8	KCl
1.530	37.6	8.0	»	–	12.2	27 0	»
1.524	36.8	8.2	»+$HgCl_2.KCl.^3/_4H_2O$	–	8.4	27.3	»
1.512	35.9	8.2	$HgCl_2.KCl.^3/_4H_2O$	–	4.5	27.5	»
1.486	34.5	8.5	»	–	0.0	27.8	»

Results similar to the above are given for 56°, 80° and 100°.

Data for the system $HgCl_2 + KCl + NH_4Cl + H_2O$ at 25° are given by Osaka and Ando 1925, 1926.

Solubility of Mercuric Chloride in Aqueous Solutions of Ethyl Alcohol at 18°.
(Laird, 1920.)

Wt. % C_2H_5OH in solvent.	Gms. $HgCl_2$ per 100 gms. sat. sol.	Wt. % C_2H_5OH in solvent.	Gms. $HgCl_2$ per 100 gms. sat. sol.
0	6.24	25.0	5.08
10.0	5.63	30.0	5.86
15.0	5.43	40.0	7.58
20.0	5 15	51.0	11.30

Solubility of Mercuric Chloride at 25° in Aqueous Solutions of :
(Moles and Marquina, 1914, 1924.)

Citric Acid.		Tartaric Acid.		Glycerol.		Sucrose.	
Per cent Citric acid in solvent.	Gms $HgCl_2$ per 100 gms. sat. sol.	Per cent Tartaric acid in solvent.	Gms. $HgCl_2$ per 100 gms. sat. sol.	Per cent Glycerol in solvent.	Gms $HgCl_2$ per 100 gms. sat. sol.	Per cent Sucrose in solvent.	Gms. $HgCl_2$ per 100 gms. sat. sol.
0.0	6.76	10.0	6.36	5.08	7.20	10.0	7.08
10.0	6.63	20.0	5.75	15.1	8.33	25.0	8.05
25.0	5.73	25.0	5.36	25.0	9.60	30.0	8.46
50.0	3.99	35.0	4.59	35.0	11.10	35.0	8.83
		42.5	3.98	50.18	14.88	40.0	9.14
		50.0	3.28	75.08	26.53	42.5	9.16
				100.00	44.22	47.0	9.68
						55.0	10.14

Ethyl ether, saturated with mercuric chloride by repeated agitation at room temperature, and also by prolonged boiling under a reflux condenser and allowing to stand at ordinary temperature for many days, contained 6.9 gms. $HgCl_2$ per 100 gms. ether. On the basis of 0.720 as the Sp. Gr. of the ether this corresponds to 5.0 gms. $HgCl_2$ per 100 cc. of ether. (Richard, 1926.)

100 gms. glycerol of $d = 1.2326$ (= 86.5 %) dissolve 53.5 gm. $HgCl_2$ at 20°
» » » $d = 1.2645$ (= 98.5 %) » 65.5 » » »
(Holm, 1921, 1922.)

100 gms. sat. solution of mercuric chloride in selenium oxychloride ($SeOCl_2$) contain 0.89 gm. $HgCl_2$ at 25°. (Wise, 1923.)

Fusion-point data for mixtures of $HgCl_2 + HgI_2$ are given by Losana, 1926. Results for $HgCl_2 + AgNO_3$ are given by Bergman, 1922-1924, 1926. Results for $HgCl_2 + TlNO_3$ are given by Bergman, 1926 and Bergman, Genke and Isaikin, 1922-1924.

MERCURY CHLORIDE (ous) Hg_2Cl_2.

The solubility product of mercurous chloride, determined by a modified electrometric method, was found by Brodsky and Scherschewer, 1926, to be $2.0.10^{-18}$ at 11°, $3.4.10^{-18}$ at 15°, $5.3.10^{-18}$ at 19° and $12.2.10^{-18}$ at 26°.5.

Fusion-point data for mixtures of Hg Cl and Ag Cl are given by Janecke, 1923.

MERCURY CYANIDE (ic) $Hg(CN)_2$.

Solubility of Mercuric Cyanide in Aqueous Solutions of Ammonia at 0°.
(Brinkley, 1922).

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$Hg(CN)_2$.	NH_3.	Solid Phase.	$Hg(CN)_2$.	NH_3.	Solid Phase.
6.31	0.0	$Hg(CN)_2$	24.68	9.40	$Hg(CN)_2.NH_3$
8.46	0.43	»	25.41	9.55	»+$Hg(CN)_2.2NH_3$
11.66	1.09	»+$Hg(CN)_2.NH_3$	24.04	11.23	$Hg(CN)_2.2NH_3$
9.40	2.06	$Hg(CN)_2.NH_3$	23.40	12.59	»
10.32	4.08	»	24.46	16.87	»
15.43	6.82	»	43.57	22.09	»
17.51	7.67	»	66.10	21.51	»
19.31	8.25	»	79.30	20.70	»

MERCURY Nitrosophenyl HYDROXYLAMINE.

100 gms. H_2O dissolve $1.25.10^{-6}$ gms. mercury nitrosophenyl hydroxylamine at 18°. (Martin.)

MERCURY IODIDE (ic) HgI_2.

Solubility of Mercuric Iodide in Methylal ($H\,CH\,(O\,CH_3)_2$). (Bourgoin, 1924.)

The methylal was purified by distillation over sodium. At the lower temperatures the solutions were saturated by constant agitation. At the higher temperatures the synthetic method was used.

t°.	Gms. HgI_2 per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. HgI_2 per 100 gms. sat. sol.	Solid Phase.
20.....	3.81	HgI_2 (red)	74.....	5.80	HgI_2 (red)
25.....	4.07	»	77.....	5.93	»
30.....	4.19	»	81.....	6.05	»
53.....	4.56	»	123.....	7.89	»
63.....	5.12	»	125 (tr. pt.).	7.96	»+ HgI_2 (yellow)
67.....	5.32	»	136.5.....	8.00	HgI_2 (yellow)
71.....	5.56	»	166.....	8.14	»

Data for the system mercuric iodide, potassium iodide and acetone at 56° are given by Pernot, 1926. The results, however, are given only in the form of a small scale diagram from which accurate numerical values cannot be read.

Fusion-point data for mixtures of $HgI_2 + AgNO_3$ are given by Bergman, 1921, 1922-1924 and 1926. Results for $HgI_2 + TlNO_3$ are given by Bergman, 1926.

MERCURY OXALATE HgC_2O_4.

100 gms. H_2O dissolve 0.0107 gm. HgC_2O_4 at 20°. (Trifnov, 1924, 1925.)

Data for the system, $HgC_2O_4 + K_2C_2O_4 + H_2O$ at 20° are also given. The five branches of the curve have, respectively, for solid phase: HgC_2O_4; $K_2C_2O_4.HgC_2O_4.2H_2O$, $2K_2C_2O_4.HgC_2O_4.3H_2O$, $3K_2C_2O_4.HgC_2O_4.4H_2O$ and $K_2C_2O_4$.

MERCURY OXIDE (ic) HgO.

Solubility of Mercuric Oxide in Aqueous Solutions of Sodium Hydroxide at 25°. Fuseya, 1920.)

The mixtures were rotated in sealed tubes for at least 4 days. Equilibrium was approached both from above and below.

Mols. NaOH per liter of sat. sol.	Millimols. HgO per liter of sat. sol.	Mols. NaOH per liter of sat. sol.	Millimols. HgO per liter of sat. sol.
0.0000	23.4	0.502	26.6
0.0096	24.6	1.0758	28.3
0.0503	24.7	2.09	30.9
0.0955	24.9		

MERCURY SULFATE (ic) Hg_2SO_4.

Freezing-point data for mixtures of $Hg_2SO_4 + H_2SO_4$ are given by Kendall and Davidson, 1921.

MESACONIC ACID (Methyl fumaric acid) $C_3H_4(COOH)_2$.

Solubility of Mesaconic Acid in Several Solvents. (Lebrun, 1925.)

Solvent.	t°.	Gms. $C_3H_4(COOH)_2$ per 100 gms. solvent.
Acetylene dichloride, cis. b. pt. 60°.2.....	40	0.006
» » trans. b. pt. 48°.3..	40	0.056
Crotonic nitrile, b. pt. 107.7-108.2.....	30	1.03
» » » 121.8-122.2.....	30	0.72

MESITYLENE $C_6H_3(CH_3)_3$.

100 gms. H_2O dissolve about 0.002 gm. mesitylene (Horiba, 1917). The terms in which the author's results are expressed are not clearly defined.

Freezing-point data for mixtures of mesitylene and sulfur dioxide are given by De Carli, 1926.

MESITYLENE PHOSPHINOUS ACID $(CH_3)_3C_6H_2P(OH)_2$.

Solubility of Mesitylene Phosphinous Acid (m. pt. 147°.35) in Water

(Creighton, 1926.)

Saturation was secured by constant agitation. The solutions were analyzed by titration with standard Ba $(OH)_2$ solution. The conductance of the solutions was also determined.

t°.	Gms. $(CH_3)_3C_6H_2P(OH)_2$ per 100 gms. sat. sol.	t°.	Gms. $(CH_3)_3C_6H_2P(OH)_2$ per 100 gms. sat. sol.
1.0	0.289	45	0.385
25	0.299	65	0.525
35	0.324	85	0.700

METHANE CH_4.

Using a special apparatus which permitted the agitation of a sample of air containing a known percentage of Pittsburgh natural gas (composed of 90 % CH_4 + 10 % C_2H_6) with water, and the removal of the sample for analysis after the period of contact with the water, the solubility coefficient α_{25} (= the volume of gas reduced to 0° dissolved by 1 vol. of H_2O at 25°, when the pressure of the gas over the water is 760 mm.) was found to be 0.032. (Milligan, 1924.)

Solubility of Mine Gas (79.4 % CH_4 + 17.1 % N_2 + 2.8 % O_2 + 0.7 % CO_2) in Water and Organic Solvents Under Pressure.

(Fischer and Zerbe, 1923.)

An autoclave of 330 cc. capacity was used. Into this was placed 100 cc. of solvent and mine gas from a steel cylinder untill a pressure of about 20 atmospheres was reached. The autoclave was then shaken at about 20° for $^1/_2$ hour. The pressure was then lowered to 1 atmosphere and a weighed amount of the solution analyzed for its contained gas. The results showed that although much nitrogen was present the absorbed gas contained the several constituents in approximately the same ratio as the used mine gas.

The author was interested principally in comparative values for various solvents.

Used solvent.	Cc. Gas dissolved by 1 vol. of solvent.	Used solvent.	Cc. Gas dissolved by 1 vol. of solvent.
Water	0.09	Acetone	0.61
Petroleum ether (b. pt. 65°)	1.34	Ethyl acetate	0.45
» (» 65–100)	0.84	Chloroform	0.32
» (» 100–150)	0.66	Carbon disulfide	0.36
Petroleum	0.56	Benzene	0.51
Paraffine oil	0.44	Xylene	0.53
Methyl alcohol	0.46	Aniline	0.16
Ethyl alcohol	0.60	Nitrobenzene	0.16
Amyl alcohol	0.44	Tri cresol	0.26
Ethyl ether	0.91	Coal tar hydrocarbon (250-300)	0.40

100 cc. H_2O dissolve 3.2 cc. Methane (0° and 760 mm) at 21°.
» Rubber » 26.8 cc. » » »

The gas dissolved by a given amount of air free rubber was pumped out with a Töpler pump and measured over mercury. Data are also given for the effect of temperature and pressure and for the relation between solubility and penetrability.

(Venable and Fuwa, 1922.)

Freezing-point lowering data (solubilities see foot-note, p. 1001) are given mixtures of DIPHENYL METHANE and each of the following compounds :

Hydroquinol, α and β Naphthol, α and β Naphthylamine, *m* and *p* Nitrophenol, *p* Phenylendiamine, Pyrocatechol (Kremann and Fritsch, 1920.)

Pyrogallol (Kremann and Fritsch, 1920.)
Picric acid (Kremann and Fritsch, 1920 and Efremov, 1918.)
Resorcinol (Kremann and Fritsch, 1920.)
Styphnic acid (Efremov, 1929 *a*.)

Results are given for mixtures of TRIPHENYL METHANE and each of the following compounds :

Hydroquinol, α and β Naphthol, Phenol, Pyrocatechol, Pyrogallol, *o*, *m* and *p* Nitrophenol, Resorcinol (Kremann, Odelga and Zawodsky, 1921.)

Quinone (Kremann, Sutter, Sitte, Strzelba and Dobotzky, 1922.)

Picric acid (Efremov, 1918 ; Rheinboldt and Kircheisen, 1926 ; Kremann, Odelga and Zawadosky, 1921.)

m Phenylendiamine (Rheinboldt and Kirscheisen, 1926 ; Kremann, Odelga and Zawadosky, 1921 ; Kremann, Mauermann, Müller and Rösler, 1923.)

p » (Kremann, Odelga and Zawadosky, 1921.)

o » (Kremann, Mauermann, Müller and Rösler, 1923)

1.2.4 Dinitrophenol (Kremann, Mauermann, Müller and Rösler, 1923.)

Sarcosine anhydride (Pfeiffer and Angern, 1926)

Styphnic acid (Efremov, 1919 *a*.)

p Toluidine (Kremann, Odelga and Zawodsky, 1921.)

Data for mixtures of TRINITRO PHENYLMETHANE and sarcosine anhydride are given by Pfeiffer and Angern, 1926.

METHYL ACETATE CH_3COOCH_3.

METHYL BUTYRATE $CH_3(CH_2)_2COOCH_3$.

SOLUBILITY OF EACH SEPARATELY IN WATER (Fühner, 1924.)

Compound.	t°.	*d* of sat. sol.	Solubility in vol. %.	Solubility in wt. %.
Methyl acetate.....	20	0.96	25.37	24.35
Methyl butyrate.....	21	0.87	1.792	1.559

The determinations were made in a very simple manner by a titration method and high accuracy is not claimed for them.

METHYLAL $HCH(OCH_3)_2$.

RECIPROCAL SOLUBILITY OF METHYLAL AND WATER. (Bourgoin, 1924.)

The methylal was purified by distilling over sodium. It had a b. pt. of 142°.3 at 760 mm.

The determinations were made by the freezing-point method and by the synthetic method.

t° of f. pt.	Gms. $HCH(OCH_3)_2$ per 100 gms. sat. sol.	t° of f. pt.	Gms. $HCH(OCH_3)_2$ per 100 gms. sat. sol.	t° of homogeneity.	Gms. $HCH(OCH_3)_2$ per 100 gms. sat. sol.
—1.35.....	5.26	— 10.78....	33.60	148.9.....	37.23
—2.77.....	10.11	— 11.0 (tr. pt.)	34.4	154.0.....	40.16
—3.31.....	11.79	— 11.0.....	36.23	159.8.....	50.46
—3.54.....	12.66	»	42.98	159.9.....	50.64
—4.54.....	15.73	»	54.17	160.2.....	55.84
—4.98.....	17.44	»	68.12	160.3.....	57.34
—5.79.....	19.15	»	85.58	160.2.....	58.04
—6.38.....	20.60	»	95.72	159.5.....	65.39
—7.54.....	23.12	— 11 (tr. pt.)..	97.5	157.5.....	72.45
—8.10.....	25.20	— 12.8.....	97.53	104.5.....	86.90
—8.60.....	25.52	— 15.5.....	97.9	55.0.....	91.08
—9.80.....	29.98	—104.8(m. pt.)	100.00		

The two liquid layers in contact at 16° were found to have respectively :

Lower layer (aqueous), d_{16} = 0.98427 and contains 32.3 gms. $HCH(OCH_3)_2$ } per 100 gms.
Upper layer (methylal), d_{16} = 0.87636 » 95.7 » } sat. sol.

METHYL ALCOHOL CH_3OH.

Freezing-Points of Mixtures of Methyl Alcohol and Water.
(Pushin and Glagoleva, 1922.)

Temp. of 1 st. cryst.	Temp. of 2 nd. cryst.	Mol. per cent CH_3OH in mixture.	Temp. of 1 st. cryst.	Temp. of 2 nd. cryst.	Mol. per cent CH_3OH in mixture.
0	–	0.0	—87.5	—101.5	60.0
—13.5	–	10.0	–	—111.0	70.0
—30.2	—102	20.0	–	—101	72.0
—59	—100.5	33.3	–	—102	80.2
—65	—102	40.0	–	—107	85.0
—78.5	—100.5	44.0	–	—103.5	90.0
—83.5	—100.5	50.0	–	—100.5	95.0
–	—100.5	54.0	—96.0	–	100

METHYL AMINES CH_3NH_2, $(CH_3)_2NH$, $(CH_3)_3N$.

Distribution of Methyl Amine at 25° Between : (Smith, 1921, 1922.)

Water and Chloroform.

Millimols. CH_3NH_2 per liter. H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
2.625	0.475	0.181
6.15	1.225	0.199
13.5	1.9	0.141
27.4	4.5	0.164

Water and Ether.

Millimols. CH_3NH_2 per liter. H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
4.90	0.575	0.117
7.60	0.90	0.118
11.25	1.225	0.109
19.1	2.05	0.107
34.5	3.9	0.113

Water and Xylene.

Millimols. CH_3NH_2 per liter H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_2}$.
1.730	0.130	0.0750
3.745	0.255	0.0680
4.990	0.501	0.0528
19.018	0.982	0.0517

Distribution of Dimethyl Amine at 25° Between Water and Ether.
(Smith, 1921, 1922.)

Millimols. $(CH_3)_2NH$ per liter of H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	Millimols. $(CH_3)_2NH$ per liter of H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
1.37	0.33	0.241	4.35	1.025	0.236
1.85	0.425	0.230	5.22	1.26	0.242
2.55	0.600	0.235	7.00	1.60	0.228
2.81	0.63	0.224	13.5	3.05	0.226

Distribution of Dimethyl Amine at 25° Between : (Smith, 1921, 1922.)

Water and Chloroform.

Millimols. $(CH_3)_2NH$ per liter of H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
1.35	0.80	0.592
2.20	1.275	0.580
3.40	2.00	0.588
4.55	2.62	0.582
5.85	3.40	0.582

Water and Xylene.

Millimols. $(CH_3)_2NH$ per liter of H_2O layer (C_1).	$C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
1.786	0.214	0.120
3.55	0.430	0.121
8.97	1.12	0.125
17.78	2.22	0.125

Acetone and Glycerol.

Millimols. $(CH_3)_2NH$ per liter of Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
1.125	2.25	0.510
2.425	4.325	0.561
4.775	7.525	0.635
10.6	15.8	0.672
20.1	27.8	0.723

DISTRIBUTION OF TRIMETHYL AMINE AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Chloroform.

Millimols. $(CH_3)_3N$ per liter of H_2O layer (C_1).	Millimols. $(CH_3)_3N$ per liter of $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.30	0.70	2.33
0.60	1.50	2.50
1.05	2.90	2.62
4.85	14.95	3.08

Water and Ether.

Millimols. $(CH_3)_3N$ per liter of H_2O layer (C_1).	Millimols. $(CH_3)_3N$ per liter of $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.800	1.2125	0.660
1.1625	1.775	0.655
1.775	2.65	0.67
3.00	4.45	0.675
6.30	8.90	0.707

Water and Xylene.

Millimols. $(CH_3)_3N$ per liter of H_2O layer (C_1).	Millimols. $(CH_3)_3N$ per liter of $C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
2.13	1.00	0.47
2.775	1.225	0.442
6.97	3.03	0.435
14.22	5.78	0.407

Di **METHYL AMINE** Acid Phthalate.

Tri **METHYL AMINE** Acid Phthalate.

DISTRIBUTION OF EACH SEPARATELY AT 25° BETWEEN ACETONE AND GLYCEROL. (Smith, 1921, 1922.)

NOTE. — "The acid phthalate salts were made by mixing standardized solutions of phthalic acid, on the one hand, and the desired amine on the other, in the proportion of two to one. It was assumed that the remaining titratable hydrogen of the phthalic acid represents one molecule of the amine acid salt."

Results for Dimethyl Amine Acid Phthalate.

Millimols. acid Phthalate per liter of Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
0.6250	3.725	0.168
0.8125	5.4875	0.148
1.00	7.80	0.128
1.30	10.875	0.119
1.70	14.75	0.115

Results for Trimethyl Amine Acid Phthalate.

Millimols. acid Phthalate per liter of Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
0.70	4.20	0.167
0.90	5.65	0.159
1.50	10.35	0.145
1.95	13.55	0.144

METHYL CHLORIDE CH_3Cl.

SOLUBILITY OF METHYL CHLORIDE IN SEVERAL ORGANIC SOLVENTS. (Kling, 1915.)

The results are expressed in terms of $l_t = (V - V_0)\frac{T_t}{F_t} - (V_n - V_c) \div V_c$ in which V = volume of gas after absorption, V_0 = original volume of gas, T_t = temp. on absolute scale, F_t = temp. of thermostat, V_n = volume of the flask, V_c = volume of solvent.

	l_t in each solvent determined separately.			
t°.	$CHCl_3$,	$\frac{CHCl}{CHCl}$	$\frac{CCl_3}{CHCl_2}$	CCl_4.
— 5	276.8	239.4	168.1	115.4
0	202.5	174.8	125.2	87.6
+ 5	158.3	130.7	98.7	68.7
10	119.5	101.2	79.0	56.2
15	93.5	76.9	65.1	45.9
20	72.9	58.6	54.1	38.0

METHYL FORMATE $HCOO(CH_3)$.

FREEZING-POINTS OF MIXTURES OF METHYL FORMATE AND TIN TETRACHLORIDE (Kournakov and Perelemouter, 1916.)

Finalt°of melting	—5.	+26.	50.6.	80.	83.3.	81.7.	78.2.	68.	59.4.	38.4.	—33.
Mol. % $SnCl_4$	10	15	20	27.5	33.3	40.	52.3	64	84	94	100

The mol. compound has the composition $SnCl_4.2\,HCOO(CH_3)$ and m. pt. 83°.3.

METHYL IODIDE CH_3I.

A sat. solution of methyl iodide in water at 22° has a $d = 2.18$ and contains 0.625 vol. % or 1.362 wt. % CH_3I. (Fühner, 1924.)

Freezing-point data for mixtures of methyl iodide + nitrogen peroxide are given by Pascal, 1923.

Di METHYL OXALATE $C_2O_4(CH_3)_2$.

FREEZING-POINTS OF MIXTURES OF DIMETHYL OXALATE AND WATER. (Skrabal, 1917.)

t° of f. pt.	Gms. $C_2O_4(CH_3)_2$ per 100 gms. sat. sol.	t° of f. pt.	Gms. $C_2O_4(CH_3)_2$ per 100 gms. sat. sol.	t° of f. pt.	Gms. $C_2O_4(CH_3)_2$ per 100 gms. sat. sol.
− 0.5(Eutec.)	4.0	36.0	10.7	48.0	19.2
+ 1.5	4.1	38.0	12.5	48.2	29.8
9.5	5.0	41.5	13.0	48.0	64.4
21.5	6.6	44.5	15.8	48.0	93.3*
37.0	9.1	48.0	17.7*	50.5	97.7
				53.5 m. pt.	100.0

* Between 17.7 and 93.3 Wt. % $C_2O_4(CH_3)_2$ two liquid phases exist.

Freezing-point lowering data for mixtures of dimethyl oxalate and the following compounds are given by Kremann, Zechner and Drâzel, 1924 : Hydroquinol, α and β naphthol, phenol, *o*, *m* and *p* nitrophenol, 1.2.4 dinitrophenol, picric acid, pyrocatechol, pyrogallol, resorcinol, *p* toluidine.

METHYL SALICYLATE $C_6H_4.OH.COOCH_3(o)$.

SOLUBILITY OF METHYL SALICYLATE AT 20° IN AQUEOUS 50 WT. PER CENT ETHYL ALCOHOL SATURATED WITH VARIOUS SALTS. (Wright, 1926.)

Solvent.	Gms. $C_6H_4OH.COOCH_3(o)$. per 100 gms. sat. sol.	Gms. Salt. per 100 gms. sat. sol.
Aq. 50 Wt. % C_2H_5OH	6.2	0.0
» + excess NaCl	8.2	10.2 (NaCl)
» + » $NaNO_3$	8.1	20.4 ($NaNO_3$)
» + » KCl	7.2	6.2 (KCl)
» + » KNO_3	6.9	3.8 (KNO_3)
» + » KBr	7.9	17.3 (KBr)

Di METHYL SULFATE $(CH_3)_2SO_4$.

100 cc. H_2O dissolve 2.8 gms dimethyl sulfate at 18°. Solution is, however, accompanied or quickly followed by decomposition. (Boulin and Simon, 1920.)

METHYL THIOCYANATE CH_3SCN.

Complete data for the T, *x* diagram of the pseudo binary system methyl thiocyanate (m. pt. — 53°.58) + methyl isothiocyanate (CH_3NCS) m. pt. + 35°.93 are given by Gillis, 1918. A single eutectic at — 64.4° was found. The author also gives data for the curve of fusion of methyl iso thiocyanate + trimethyl tri thiocyanate $(CH_3SCN)_3$. A single eutectic at 34.9° was found. The boiling-point curve for $CH_3SCN + CH_3NCS$ is also given.

MICHLER'S KETONE (Tetramethyl-p_2-diamido benzophenone)

$CO[C_6H_4](4).N[(CH_3)_2]_2$

100 gms absolute alcohol dissolve 0.63 gm. Michler's Ketone at 20°-25°

» quinoline » 9.72 » » » »

» equi. mol. mixture of alcohol and quinoline dissolve 6.86 gms. Michler's Ketone at 20°-25°. (Pucher and Dehn, 1921.)

MONOTROPITOSIDE $C_{19}H_{26}O_{12}.H_2O$.

SOLUBILITY OF MONOTROPITOSIDE IN SEVERAL SOLVENTS AT 18-20°. (Bridel and Picard, 1926.)

This compound is the glucoside which generates methyl salicylate and is formed by the union of 1 mol. of methyl salicylate, 1 mol. of glucose and 1 mol. of xylose, with elimination of 2 mols of water.

Solvent.	Gms. $C_{19}H_{26}O_{12}$ per 100 gms. solvent.	Solvent.	Gms. $C_{19}H_{26}O_{12}$ per 100 gms. solvent.
Water	8.09	Anhydrous ethyl acetate	0.172
95 % alcohol	0.665	» acetone	0.154
Abs. alcohol	0.344	» ethyl ether	0.038
Chloroform	0.100		

MORPHINE $C_{17}H_{19}NO_3.H_2O$.

Solubility of Morphine in Water at 18°.

A detailed discussion and calculation of the dissociation constants of morphine as a base and as an acid is given by Kolthoff, 1925. This author also reports a series of determinations of the solubility of morphine in buffer mixtures composed of 0.2 mol. Na_2CO_3 and 0.2 mol. $NaHCO_3$. A minimum solubility of $5.6.10^{-4}$ mols or 0.165 gm. morphine per liter was found at p_H 9.1. This is in good agreement with the value of Maus, which is $4.7.10^{-4}$ mol. or 0.143 gm. per liter. The result found by Heiduschka and Faul (1917) for water of conductivity of 2.10^{-6} sec./ohms is $6.1.10^{-4}$ or 0.181 gm. morphine per liter at 18°. As a mean Kolthoff chooses 5.10^{-4} mol. or 0.147 gm. morphine per liter at 18°.

Solubility of Morphine in Aqueous Solutions of Ammonia.

(Heiduschka and Faul, 1917.)

An excess of finely ground crystalline morphine was constantly agitated with the ammonia solutions in a thermostat. The saturated solutions were analyzed by evaporating and weighing the residues dried at 100°.

Normality of aq. ammonia.	t°.	Gms. $C_{17}H_{19}NO_3.H_2O$ per 100 cc. sat. sol.	Normality of aq. ammonia.	t°.	Gms. $C_{17}H_{19}NO_3.H_2O$ per 100 cc. sat. sol.
0.1	18	0.0882	0.588 (= 1% NH_3)	18	0.2480
0.1	25	0.0974	0.588 (= 1% NH_3)	25	0.2550
0.2	18	0.1226	2.941 (= 5% NH_3)	18	0.4316
0.2	25	0.1240	2.941 (= 5% NH_3)	25	0.4406
1.0	18	0.3086	5.88 (=10% NH_3)	18	0.6380
1.0	25	0.3242	5.88 (=10% NH_3)	25	0.7100

MORPHINE HELIANTHATE $C_{17}H_{19}NO_3.C_{14}H_{15}N_3SO_3$.

1000 cc. water dissolve 0.4 gm. morphine helianthate at 20–25°.

(Stark and Dehn, 1918.)

MORPHINE PICRATE $C_{17}H_{19}NO.OH.C_6H_2(NO_2)_3$.

Solubility of Morphine Picrate in Several Solvents at 20°.

The « saturated » solutions containing precipitated crystals were allowed to stand in an incubator at 20° for two days and then analyzed by evaporation and weighing the residues dried at 100°. (Maplethorpe and Evers, 1925.)

Solvent.	Gms. Picrate per 100 gms. sat. sol.
Water	0.22
Abs. alcohol	0.14
Acetone	13.86

NAPHTHALENE $C_{10}H_8$.

By means of an optical method, involving the use of an interferometer of the type described by Jamin (*Ann. chim. phys.*, 52, 171, 1858), it was found that 1000 cc. of H_2O dissolve 0.022 gm. $C_{10}H_8$ at 15° and 0.040 gm. at 25°. (Mitchell, 1926.)

Solubility of Naphthalene in Aqueous Solutions of Formic Acid.

(Christiansen, 1918.)

Note. — The determinations were made by mixing together the several ingredients and, after a period of standing in a thermostat, estimating from the presence or absence of solid, the composition corresponding to a saturated solution. Constant agitation was not employed.

At the higher concentrations the amount of naphthalene which just dissolved was determined.

	Gms. per 100 gms. sat. sol.	
t°.	HCOOH.	$C_{10}H_8$.
0.....	76.6	0.106
0.....	84.5	0.188
0.....	92.2	0.331
0.....	97.7	0.477

	Gms. per 100 gms. sat. sol.	
t°.	HCOOH.	$C_{10}H_8$.
25.....	56.2	0.089
25.....	67.8	0.168
25.....	81.0	0.400
25.....	91.6	0.715
25.....	97.0	1.185

Solubility of Naphthalene in Aqueous Solutions of Acetic Acid

(Christiansen, 1918.) See Note on preceding page.

t°.	Gms. per 100 gms. sat. sol. CH_3COOH.	$C_{10}H_8$.	t°.	Gms. per 100 gms. sat. sol. CH_3COOH.	$C_{10}H_8$.
0°	71.4	0.482	25°	68.7	0.967
0	81.1	1.2	25	74.5	1.57
0	87.0	1.92	25	79.4	2.42
0	89.9	2.58	25	83.2	3.59
25	39.7	0.098	25	84.7	4.81
25	47.5	0.195	25	86.7	6.07
25	56.5	0.39	25	86.9	7.3
25	60.1	0.486	25	86.3	12.3

Solubility of Naphthalene in Aqueous Solutions of Butyric Acid.

(Christiansen, 1918.) See Note on preceding page.

t°.	Gms. per 100 gms. sat. sol. C_3H_7COOH.	$C_{10}H_8$.	t°.	Gms. per 100 gms. sat. sal. C_3H_7COOH.	$C_{10}H_8$.
0°	75.3	4.12	25°	65.2	6.07
0	84.3	8.27	25	75.0	12.38
0	86.9	9.67	25	76.0	15.49
25	55.3	4.07	25	76.3	20.7

Solubility of Naphthalene in Aqueous Solutions of Propionic Acid.

(Christiansen, 1918.) See Note on preceding page.

t°.	Gms. per 100 gms. sat. sol. C_2H_5COOH.	$C_{10}H_8$.	t°.	Gms. per 100 gms. sat. sal. C_2H_5COOH.	$C_{10}H_8$.
0°	69.1	1.5	25°	58.7	1.5
0	78.6	3.0	25	67.3	3.0
0	86.6	6.0	25	74.3	6.0
0	89.6	9.97	25	80.0	10.92
25	26 9	0.1	25	80.4	16.3
25	38.1	0.3	25	78.8	20.95
25	49.6	0.75			

Solubility of Naphthalene in Aqueous Solutions of Alcohols.

(Christiansen, 1918.) See Note on preceding page.

Aq. Methyl Alcohol.

t°.	Gms. per 100 gms. sat. sol. CH_3OH.	$C_{10}H_8$.
0°	80.7	0.91
0	86.87	1.83
0	95.32	3.72
0	100	4.1
25	43.10	0.11
25	56.5	0.34
25	65.1	0.75
25	69.52	1.18
25	79.2	2.4
25	86.5	4.55
25	90.86	8.77
25	91.0	8.84
25	100	9.9

Aq. Ethyl Alcohol.

t°.	Gms. per 100 gms. sat. sol. C_2H_5OH.	$C_{10}H_8$.
0°	51.4	0.235
0	74.3	1.183
0	88.6	2.89
0	93.6	4.08
0	100	4.90
25	29.7	0.04
25	34.1	0.108
25	39.1	0.167
25	41.4	0.225
25	47.7	0.446
25	58.2	1.14
25	63.8	1.62
25	72.9	2.83
25	79.5	4.42
25	88.6	9.50
25	100	11.8

Aq. Propyl Alcohol.

t°.	Gms. per 100 gms. sat. sol. C_3H_7OH.	$C_{10}H_8$.
25°	23.7	0.105
25	27.4	0.214
25	33.7	0.432
25	45.1	1.11
25	58.8	2.28
25	69.7	3.61
25	80.4	5.81
25	85.5	7.84
25	100	11.9

Solubility of Naphthalene in Methyl Alcohol

[Speyers, 1902 (See Note, p. 1001); Ward, 1926.]

In the following table the densities are taken from a curve plotted from the results of Speyers and the solubilities from a curve plotted from the results of Ward.

t°.	*d* of sat. sol.	Gms. $C_{10}H_8$ per 100 gms. CH_3OH.	t°.	*d* of sat. sol.	Gms. $C_{10}H_8$ per 100 gms. CH_3OH.
0.....	0.8194	4.00	60.....	0.837	61.0
10.....	0.812	5.6	65.....	0.870	120.0
20.....	0.807	8.5	67.5.....	0.902	205
25.....	0.805	10.0	70.....	—	460
30.....	0.804	12.0	71.....	—	630
40.....	0.805	18.0	72.....	—	900
50.....	0.813	30.5	73.....	—	1200
55.....	0.82	41.5	74.....	—	1700

Solubility of Naphthalene in Ethyl Alcohol and in Propyl Alcohol.

(Speyers, 1902, See Note, p. 1001.)

Results for Ethyl Alcohol.

t°.	*d* of sat. sol.	Gms. $C_{10}H_8$ per 100 gms. C_2H_5OH.
0.....	0.8175	5.1
10.....	0.814	7.6
20.....	0.810	10.2
25.....	0.809	11.6
30.....	0.809	13.4
40.....	0.812	18.0
50.....	0.822	37.0
60.....	0.855	80.0
65.....	0.890	125.0
70.....	0.930	500.0

Results for Propyl Alcohol.

t°.	*d* of sat. sol.	Gms. $C_{10}H_8$ per 100 gms. C_3H_7OH.
0.....	0.8285	4.55
10.....	0.824	5.9
20.....	0.821	8.5
25.....	0.820	10.0
30.....	0.820	12.0
40.....	0.823	17.5
50.....	0.837	35.0
60.....	0.867	100
65.....	0.897	160
68.5.....	0.933	361

Solubility of Naphthalene in Acetone, Acetic Acid and in Aniline.

(Ward, 1926.)

The determinations were made by the synthetic method. The results are given in terms of the weights of the ingredients of each mixture used for the determination. These have been calculated to grams of naphthalene per 100 gram of each solvent.

Results for Acetone.

t°.	Gms. $C_{10}H_8$ per 100 gms. CH_3COCH_3.
6.3....	32.0
14.3....	43.4
24.2....	64.9
32.6....	94.4
39.3....	127.4
47.2....	191.2
52.9....	258.7
58.5....	364.5
62.7....	496.7
67.2....	738.9
69.5....	926.0

Results for Acetic Acid.

t°.	Gms. $C_{10}H_8$ per 100 gms. CH_3COOH.
15.6....	9.73
23.5....	13.14
29.0....	16.79
36.5....	24.21
45.2....	37.33
50.4....	51.84
59.6....	110.3
64.9....	194.5
68.3....	297.0
75.1....	958.5

Results for Aniline.

t°.	Gms. $C_{10}H_8$ per 100 gms. $C_6H_5NH_2$.
0.6....	10.27
10.6....	15.5
12.9....	16.9
22.0....	25.0
29.9....	36.14
37.4....	52.73
50.8....	112.2
60.8....	230.4
65.4....	340.5
74.4....	1014.0

Solubility of Naphthalene in Benzene, in Chlorbenzene and in Nitrobenzene. (Ward, 1926.)

Results for Benzene.				Results for Chlor Benzene.		Results for Nitrobenzene.	
t°.	Gms. $C_{10}H_8$ per 100 gms. C_6H_6.	t°.	Gms. $C_{10}H_8$ per 100 gms. C_6H_6.	t°.	Gms. $C_{10}H_8$ per 100 gms. C_6H_5Cl.	t°.	Gms. $C_{10}H_8$ per 100 gms. $C_6H_5NO_2$.
0.....	28.0	40.....	121	4.2....	23.87	2.9....	20.01
5.....	33.0	45.....	148	8.8....	29.88	13.8....	29.29
10.....	39.0	50.....	194	22.1....	47.04	24.0....	42.46
15.....	47.0	55.....	255	29.4....	60.96	45.3....	99.24
20.....	56.0	60.....	340	42.8....	102.3	60.2....	219.1
25.....	67.5	65.....	470	49.0....	133.9	65.3....	313.4
30.....	81.5	70.....	750	62.6....	286.5	71.8....	598.8
35.....	100.0						

Solubility of Naphthalene in Normal Butyl Alcohol and in Carbon Tetrachloride. (Ward, 1926.)

Results for Normal Butyl Alcohol.				Results for Carbon Tetra Chloride.			
t°.	Gms. $C_{10}H_8$ per 100 gms. $CH_3(CH_2)_2CH_2OH$.	t°.	Gms. $C_{10}H_8$ per 100 gms. $CH_3CH_2)_2CH_2OH$.	t°.	Gms. $C_{10}H_8$ per 100 gms. CCl_4.	t°.	Gms. $C_{10}H_8$ per 100 gms. CCl_4.
11.7...	7.28	56.9...	65.80	0.4...	11.3	39.5..	53.08
22.0...	10.54	63.2...	131.6	6.0...	13.9	46.9..	75.18
24.3...	11.44	68.1...	269.2	13.0...	17.96	58.3..	142.6
31.6...	15.43	70.1...	402.2	19.5...	23.12	64.8..	226.0
35.6...	18.23	71.7...	552.5	28.2...	32.74	72.4..	503.4
46.5...	32.26	73.9...	887.6				
52.3...	46.33	76.0...	1630.0				

Solubility of Naphthalene in Chloroform. (Speyers, 1902; See Note p. 1001.)

t°.	*d* of sat. sol.	Gms. $C_{10}H_8$ per 100 gms. $CHCl_3$.	t°.	*d* of sat. sol.	Gms. $C_{10}H_8$ per 100 gms. $CHCl_3$.
0.....	1.393	26.12	35.....	–	80
10.....	1.355	32.0	40.....	1.205	94
20.....	1.300	45.0	45.....	–	112.0
25.....	1.280	54.0	50.....	1.150	132.0
30.....	1.255	66	55.....	–	158.0

Solubility of Naphthalene in Hexane and in Toluene.

Results for Hexane (1).				Results for Toluene (2).	
t°.	Gms. $C_{10}H_8$ per 100 gms. $CH_3(CH_2)_4CH_3$.	t°.	Gms. $C_{10}H_8$ per 100 gms. $CH_3(CH_2)_4CH_3$.	t°.	Gms. $C_{10}H_8$ per 100 gms. $C_6H_5CH_3$.
8.7.....	9.83	49.6.....	76.10	—15.....	15
14.8.....	12.80	49.5.....	76.47	0.....	25
19.5.....	15.68	53.7.....	105.6	10.....	34
27.7.....	22.60	57.9.....	148.1	20.....	48
28.5.....	23.14	58.4.....	153.8	25.....	58
30.8.....	25.90	62.3.....	218.9	30.....	75
32.2.....	28.15	64.6.....	288.1	35.....	83
36.1.....	34.50	69.1.....	511.1	40.....	102
38.0.....	37.94	69.4.....	523.5	45.....	129
42.3.....	48.68	72.5.....	817.4	50.....	163
45.8.....	59.84			55.....	210
				60.....	260
				67.4.....	389

(1) Ward, 1926. (2) Ward, 1926; Rhodes and Eisenhauer, 1927.

The results of Speyers, 1902, for the solubility of naphthalene in toluene, when recalculated in accordance with the Note, p. 1001, were found to fall below the curve given by the results of Ward and Rhodes and Eisenhauer

Solubility of Naphthalene in Xylene.

(Rhodes and Eisenhauer, 1927.)

The temperatures of appearance of the first crystal and of disapqearance of the last crystal in known mixtures of naphthalene and xylene were accurately determined and the mean taken as the temperature of solubility. The xylene was a mixtures of *m* and *p* xylene practically free of *o* xylene.

t°.	Gms. $C_{10}H_8$ per 100 gms. $C_6H_4(CH_3)_2$ *m* and *p*.	t°.	Gms. $C_{10}H_8$ per 100 gms. $C_6H_4(CH_3)_2$ *m* and *p*.	t°.	Gms. $C_{10}H_8$ per 100 gms. $C_6H_4(CH_3)_2$ *m* and *p*.
—22.0.....	5.0	6.0.....	25.0	35.0.....	70.0
—13.0.....	10.0	11.2.....	30.0	38.4.....	80.0
— 6.0.....	15.0	19.5.....	40.0	41.4.....	90.0
+ 0.4.....	20.0	25.6.....	50.0	44.7.....	100.0
		30.6.....	60.0		

Similar results are given for the solubility of naphthalene in refined heavy solvent naphtha and heavy coal tar oil. Data for the effect of cresol and of quinoline upon the solubility of naphthalene in heavy solvent naphtha and heavy coal tar oil are also given.

Solubility of Naphthalene in Tetrachlor Ethane under High Pressures, at 30°. (Cohen, de Meester and Moesveld, 1924-1925.)

Pressure in atmospheres.	Gms. $C_{10}H_8$ per 100 gms. sat. sol.	Pressure in atmospheres.	Gms. $C_{10}H_8$ per 100 gms. sat. sol.
0	35.07	750	23.33
250	30.26	1000	20.89
500	26.40		

100 gms. Methyl Formate dissolve 33.9 gms. Naphthalene at 25°. (Kröber, 1919).

100 gms. Para Cymene (b. pt. 176-176.5) dissolve 14.22 gms. Naphthalene at 30° (Wheeler, 1920.)

100 gms. Quinoline dissolve 3.02 gms. Naphthalene at 20-25° (Pucher and Dehn, 1921.)

100 gms. Equimol mixture of Quinoline and Ethyl alcohol dissolve 4.69 gms. naphthalene at 20-25°. (Pucher and Dehn, 1921.)

Data for the solubility and vapor pressures of naphthalene in (1) fresh wash oil (2) used oil after steam distillation and (3) still residues, are given by Bunte and Pippig, 1923. The results are of interest chiefly in the illuminating gas industry.

Freezing-point lowering data (solubilities see foot-note, p. 1001) are given for mixtures of naphthalene and each of the following compounds :

β Naphthol (Rheinboldt and Kirscheisen, 1926.)
β Naphthylamine (Rheinboldt and Kirscheisen, 1926.)
Nitro Naphthalene (Pascal, 1920.)
p Nitro Phenol (Rheinboldt, Henning and Kirscheisen, 1925.)
Pyrocatechol (Rheinboldt, Henning and Kirscheisen, 1925.)
Picric acid (de Gee, 1916: Rheinboldt, Henning and Kirscheisen, 1925.)
Picrylchloride (Efremov, 1918.)
Picramide » »
Phthalic anhydride (Monroe, 1919.)
Quinone (Kremann, Sutter, Sitte, Strzelba and Dobotzky, 1922.)
Styphnic acid (Efremov, 1919 *a*.)
Urethan (Vasilev, 1917.)

Mono Nitro NAPHTALENE (α) $C_{10}H_7NO_2$ (α).

Solubility of α Mononitro Naphthalene (m. pt. 57°.5) in 95 per cent Ethyl Alcohol. (Crismer and Timmermans, 1920.)

The determinations were made by adding alcohol from a buret to weighed amounts of α mononitro naphthalene and observing the clouding point. The results were plotted and the following read from the curve.

t°.	Gms. $C_{10}H_7NO_2$ (α) per 100 gms. sat. sol.	t°.	Gms. $C_{10}H_7NO_2$ (α) per 100 gms. sat. sol.
26.....	23.96 (cryst.)	41.....	42.0 and 82.0 liquid layers
25.5...	24.82 »	42.....	45.0 » 80.5 »
25.5...	26.3 liquid layer	43.....	50.0 » 78.0 »
30.3...	27.4 «	44.....	58.0 » 73.5 »
34.....	31.1 »	44.1 (crit. t.).	65.0 » 65.0 »
38.....	36.4 »	42.....	87.4 (cryst.)
40.....	40.0 »	44.5.....	93.2 »

100 gms. glycol diacetate ($CH_3 CO O CH_2.CH_2 O OC.CH_3$ b. pt. 188-189°.6) dissolve 0.9 gm. trinitro naphthalene at 25°. The sat. solution was analyzed by evaporating in a wagon pipet, but about 9 months were required for the determination. (Taylor and Rinkenbach, 1926.)

Freezing-point lowering data (solubilities see foot-note, p. 1001) are given for the following mixtures :

α Benzyl Naphthalene	+	Picric Acid	(Efremov, 1918.)
» »	+	Styphnic Acid	(Efremov, 1919 *a*.)
α and β Brom »	+	Picric Acid	(Efremov, 1918.
» »	+	Styphnic Acid	(Efremov, 1919 *a*.)
α and β Chlor »	+	Picric Acid	(Efremov, 1918.)
α Chlor »	+	Styphnic Acid	(Efremov, 1919 *a*.)
Dioxy Naphthalenes	+	α and β Naphthylamines	(Kremann, Hemmelmayr and Riemer, 1922.)
» »	+	*o*, *m* and *p* Phenylene diamine	(Kremann, Hemmelmayr and Riemer, 1922.)
» »	+	Succinimide	(Kremann and Dietrich, 1923.)
α Nitro Naphthalene	+	Picric Acid	(Efremov, 1918.)
» »	+	Hydroquinol + Pyrocatechol	(Senden, 1923.)
» »	+	Pyrocatechol	»
» »	+	» + Resorcinol	»
» »	+	Resorcinol	»
» »	+	Styphnic Acid	(Efremov, 1919 *a*.)
» »	+	Di and Trinitro naphthalenes	(Pascal, 1920.)
» »	+	α Trinitro toluene	(Wogrinz and Vari, 1919.)
Dinitro Naphthalenes	+	Trinitro Naphthalenes	(Pascal, 1920.)
Naphthalene picrate	+	Methyl Naphthalene Picrates	(Meyer and Meyer, 1919.)

NAPHTALENE SULFONIC ACIDS.

Solubility of Benzyl Pseudo Thiourea Salts of Naphthalene Mono and Disulfonic Acids, in 0.2 Normal Hydrochloric Acid.

(Chambers and Scherer, 1924.)

The experiments were made to obtain data upon which methods for the analytical separation of naphthalene sulfonic acids might be based.

Gms. compound per liter of sat. sol. in 0.2 *n*.HCl.

Benzyl pseudo thio urea salt of Naphthalene :

t°.	α monosulfonate.	β monosulfonate.	1.5 disulfonate.	2.7 disulfonate.	2.6 disulfonate.
0.....	4.4	0.2	0.03	0.7	0.7
10.....	5.8	0.3	0.07	1.2	1.1
20.....	7.7	0.5	0.16	2.2	1.6
30.....	10.1	0.8	0.35	3.9	2.4
40.....	13.5	1.2	0.77	6.6	3.7
50.....	17.8	2.2	1.7	11.5	5.7
60.....	23.5	3.5	3.6	20.0	8.8
70.....	30.9	5.5	7.8	34.7	13.8
80.....	40.4	8.6	16.8	59.4	20.4
90.....	54.0	13.7	35.7	103.5	31.0
100.....	70.0	21.6	77.6	177.8	47.3

SOLUBILITY OF α AND β NAPHTHYLAMINE SALTS OF NAPHTHALENE MONO AND DISULFONIC ACIDS, IN 0.01 NORMAL HYDROCHLORIC ACID. (Wales, 1922.)

The solutions were saturated by constant agitation in a thermostat for one day. Freshly prepared mixtures were used in all cases. The saturated solutions were analyzed by evaporation to dryness and weighing the residue. The author does not state clearly that 0.01 *n* HCl was used as solvent in all cases, but this is apparently the case since it is mentioned that the compounds hydrolyze in pure water and that 0.01 *n* HCl is necessary to prevent hydrolysis. Results are given for intervals of 5° between 25° and 98°.

	Grams each compound determined separately per 100 gms. solvent at					
	25°.	35.	45°.	55°.	70°.	90°.
α Naphthylamine salt of :						
Naphthalene α Mono sulfonate.	0.3125	0.5007	0.7340	0.9733	1.368	2.028
» β » .	0.2039	0.2985	0.4420	0.6243	0.8493	2.132
β Naphthylamine salt of :						
Naphthalene β Mono sulfonate.	0.0563	0.0736	0.1008	0.1434	0.2393	0.4667
» α » .	0.1735	0.2533	0.3985	0.6044	1.141	2.980
Ferrous salt of Naphthalene β Mono sulfonate.....	0.3022	0.4233	0.6174	0.9171	1.393	2.882
α Naphthylamine salt of :						
Naphthalene 1.5 Di sulfonate.	0.0605	0.0853	0.1033	0.1563	0.2212	0.4010
» 1.6 » .	2.290	4.210	9.590	–	–	–
» 2.6 » .	0.517	0.7178	1.005	1.288	2.062	3.770
» 2.7 » .	0.8689	1.162	1.599	2.405	10.30	87.70
β Naphthylamine salt of :						
Naphthalene 1.5 Di sulfonate.	0.0727	0.0887	0.1233	0.1701	0.2562	0.4427
» 1.6 » .	0.2952	0.4934	0.6789	0.9546	1.852	4.019
» 2.6 » .	0.0296	0.0412	0.0594	0.0702	0.1093	0.2207
» 2.8 » .	0.1327	0.1917	0.2737	0.4241	0.6791	1.433

The Ferrous salt of naphthalene β mono sulfonate crystallized with 6 H_2O. The solubility results are in terms of the anhydrous compound. The solubility curve for α naphthylamine salt of naphthalene β sulfonate shows a break at 54°, and that for the α naphthylamine salt of naphthalene α sulfonate shows a break at 66°.

β NAPHTHOL $C_{10}H_7OH$.

SOLUBILITY OF β NAPHTHOL IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°. (Knox and Richards, 1919.)

Equiv. Normalities.		Equiv. Normalities.		Equiv. Normalities.	
HCl.	$C_{10}H_7OH$.	HCl.	$C_{10}H_7OH$.	HCl.	$C_{10}H_7OH$.
0.00	0.00524	4.343	0.00333	8.674	0.00307
1.466	0.00410	5.785	0.00319	11.47	0.00341
2.952	0.00360	7.122	0.00316		

Freezing-point lowering data for mixtures of α naphthol and β naphthylamine are given by Rheinboldt, Henning and Kirscheisen, 1925, and Rheinboldt and Kirscheisen, 1926. Results for mixtures of β naphthol and both dinitro and trinitro toluene are given by Giua and Marcellino, 1920. Results for β naphthol + *p* toluidine are given by Kremann and Strochschneider 1918 and Kremann, Lupfer and Zawodsky, 1920.

Freezing-point data are given for mixtures of α naphthol and of β naphthol with each of the following compounds :

α and β Naphthylamine (Kremann and Strochschneider, 1918).
m and *p* Amino Phenol (Kremann, Lupfer and Zawodsky, 1920).
o, *m* and *p* Phenylene diamine (Kremann and Strochschneider, 1918.)
Salicylaldehyde (Kremann and Zechner, 1925).
Succinic acid (Kremann and Drazil, 1924).
Succinimide (Kremann and Dietrich, 1923).
Quinone (Kremann, Sutter, Sitte, Strzelba and Dobotzky, 1922).

Data for mixture of β naphthol methyl ester and each of the following compounds are given by Giua and Marcellino, 1920, picric acid, dinitro toluene and trinitro toluene.

SOLUBILITY OF NITROSO β NAPHTHOL ($C_{10}H_6ONOH$) IN AQUEOUS SOLUTIONS OF ACETIC ACID AT 10°. (Nicolardot and Valli-Donan, 1918.)

Gms. CH_3COOH per 100 gms. solvent.....	0.0	1.0	2.5	5.0	10.0
» $C_{10}H_6ONOH$ per 100 gms. sat. sol..	0.017	0.022	0.023	0.031	0.064

2-Amino-5 **NAPHTHOL-1-SULFONIC ACID** $C_{10}H_5(5)OH(2)NH_2(1)SO_3H$.

1000 cc. cold water dissolve 2.12 gms. of the compound. The solubility of the potassium salt of the compound is about 94 grams per liter at 18°.
(Bucherer and Wahl, 1921.)

β **NAPHTHYLAMINE** $C_{10}H_7.NH_2$.

100 gms. para cymene (b. pt. 176-176.5°) dissolve 8.63 gms. β $C_{10}H_7NH_2$ at 30°. (Wheeler, 1920.)

Freezing-point lowering data (solubilities see foot-note, p. 1001) are given for α naphthylamine + 1.2.6 dinitrotoluene by Kremann, Hönigsberg and Mauermann, 1923. For mixtures of β naphthylamine + propionic acid by Kremann, Weber and Zechner, 1925. For mixtures of β naphthylamine + pyrocatechol and β naphthylamine + resorcinol, by Kremann and Csanyi, 1916).

Freezing-point data are given for mixtures of α naphthylamine and of β naphthylamine with each of the following compounds :

m Aminophenol (Kremann and Hohl, 1920.)
o, *m* and *p* Nitro phenol } (Kremann and
1.2.4 Dinitro phenol } Grasser, 1916.)
Pyrogallol (Kremann and Zechner, 1918.)
Quinone (Kremann, Sutter, Sitte, Strzelba and Dobotzky, 1922.)
Salicylic Acid } (Kremann, Weber and
Succinic Acid } Zechner, 1925.)
1.2.4 Dinitro Toluene (Kremann and Grasser, 1916.)
1.3.4 and 1.3.5 Dinitro Toluene (Kremann, Hönigsberg and Mauermann, 1923.)

Freezing-point data for mixtures of α and β benzylidene naphthylamine are given by Rheinboldt and Kirscheisen, 1926.

α, β **NAPHTHYLAMINE HELIANTHATE** $C_{10}H_7NH_2.C_{14}H_{15}N_3SO_3$.

1000 cc. water dissolve 0.132 gm. of the α compound at 20-25° } (Stark and Dehn, 1918.)
» » 0.103 » β » » }

NAPHTHYLAMINE Di SULFONIC ACIDS 2.6.8 and 2.5.7 $C_{10}H_5(NH_2)(SO_3H)_2$.

100 gms. sat. sol. of the 2.6.8 compound in water contain 9.24 gms. at 15°.
» » 2.5.7 » » 22.97 »
(Braunschweig, 1926.)

NARCEINE $C_{22}H_{27}NO_8$.

SOLUBILITY OF NARCEINE IN WATER AT 18° (Kolthoff, 1925.)

Narceine hydrochloride is so strongly hydrolyzed that it does not dissolve in water. A 0.01 mol. solution yields crystals on cooling. The dissociation constants determined in very dilute solutions were : basic constant $K_b = 2.10^{-11}$, acid constant $K_S = 5.10^{-10}$. Hence narceine is a stronger acid than base The isoelectric point is near $p_H = 6.4$ and here the narceine has a minimum solubility, which was calculated to be $1.3.10^{-3}$ mol. per liter.

The solubility product as a base is $L_{Narceine\,OH} = [Narc\cdot][OH'] = 2.6.10^{-14}$.
» » an acid is $L_{Narceine\,H} = [Narc'][H\cdot] = 6.5.10^{-13}$.

NARCEINE PICRATE.

100 gms. sat. sol. of Narceine picrate in water contain 0.027 gm of the cmpd. at 20°.
» » abs. Alcohol » 0.01 » »
» » Acetone » 5.23 » »

See remarks under Morphine picrate, p. 1303. (Mapelthorpe and Evers, 1925.)

NARCOTINE PICRATE $C_{22}H_{23}NO_2.OH.C_6H_2(NO_2)_3$.

100 gms. sat. sol. of Narcotine picrate in water contain 0.02 gm of the cmpd. at 20°.
» » abs. Alcohol » 0.13 » »
» » Acetone » 30.0 » »

See remarks under Morphine picrate, p. 1303. (Mapelthorpe and Evers, 1925.)

Solubility of Narcotine ($C_{22}H_{23}NO_7$) in Water at 18°. (Kolthoff, 1925.)

The dissociation constant was found to be $K = 1.5.10^{-8}$ The determination was beset with difficulties due to the extremely slight solubility of narcotine. The addition of a trace of alkali precipitates narcotine from a very dilute solution. As the result of many experiments it was found that narcotine was in equilibrium with a narcotine hydrochloride solution which was 0.00092 normal and had a p_H of 5.0. That is a p_{OH} of 9.2 or $[OH']$ of $6.4.10^{-10}$. From this the solubility product of narcotine $L_{Narcotine} = 9.2.10^{-4}.6.4.10^{-10} = 6.10^{-13}$. From L and K the solubility in water was calculated to be 4.10^{-5} mol., corresponding to 0.020 gms. narcotine per liter. A direct determination by Mauz gave 0.0174 gm. per liter.

NEODYMIUM ACETATE, $Nd(CH_3COO)_3.H_2O$.

100 gms. sat. sol. of neodymium acetate in water contain 20.76 gms. $Nd(CH_3COO)_3$ at 25°. Constant agitation was employed for obtaining saturation.

(Meyer and Müller, 1920.)

NEODYMIUM TriCHLORIDE, $NdCl_3.6H_2O$.

Solubility of Neodymium Trichloride in Water and in Hydrochloric Acid.
(Williams, Fogg and James, 1926.)

Constant agitation was employed and equilibrium was approached from above and from below.

t°.	Gms. $NdCl_3$ per 100 gms. sat. sol. in Water.	Gms. $NdCl_3$ per 100 gms. sat. sol. in aq. HCl of $d = 1.1051$.	Solid Phase in each case.
10.....	49.16	26.16	$NdCl_3.6H_2O$
20.....	49.49	26.57	»
30.....	49.91	27.92	»
40.....	50.41	29.83	»
55.....	51.11	31.94	»

Solubility of Neodymium Trichloride and of Neodymium Oxide in Aqueous Solutions of Ammonium Chloride at 15°, 30°, 50° and 100°.
(Prandtl and Rauchenberger, 1920.)

Note — The results are given only in the form of small scale diagrams and it is stated that the numerical data will be published in full in the dissertation of Johanna Rauchenberger, University of München, 1920. The equilibrium $Nd(OH)_3 + 3\,NH_4Cl \rightleftharpoons NdCl_3 + 3\,NH_3 + 3\,H_2O$ was approached by the authors from both sides. The composition of the basic chlorides obtained by shaking the oxide with 1.0*n* NH_4Cl at different temperatures, and drying over soda lime, was approximately as follows:

At 15°. At 30°. At 50°.
$Nd_4Cl_2O_5.9H_2O$; $Nd_8Cl_3O_{11}H.20H_2O$ — $Nd_{13}Cl_2O_{19}H.30H_2O$; $Nd_9Cl_3O_{12}.22H_2O$.

NEODYMIUM LACTATE, $Nd(C_3H_5O_3).2\,1/2\,H_2O$.

One liter of sat. solution of neodymium lactate in water contains 24.775 gms. $Nd(C_3H_5O_3)_3\,2\,1/2\,H_2O$ at 20°. Saturation was secured by constant agitation.

(Jantsch, 1926.)

NEODYMIUM Cobalt NITRATE, $2\,Nd(NO_3)_3.3\,Co(NO_3)_2.24\,H_2O$.

Solubility of Neodymium Cobalt Nitrate in Water
(Prandtl and Ducru, 1926.)

t°.	*d.* of sat. sol.	Gms. per 1000 gms. sat. sol. Nd_2O_3.	Co_3O_4.	Double salt.
15....	1.65	14.0	9.28	68.3
30....	1.68	14.84	9.84	72.4
45....	1.72	15.71	10.43	76.6
60....	1.77	16.63	11.16	81.1

SOLUBILITY OF NEODYMIUM DOUBLE NITRATES IN WATER. (Prandtl and Ducru, 1926.)

The saturated solutions were prepared by constant shaking in a thermostat.

Double salt of	t°.	*d* of sat. sol.	Gms. per 100 gms. sat. sol. Nd_2O_3.	Other metal oxide.	Double salt.
Neodymium magnesium nitrate $2Nd(NO_3)_3.3Mg(NO_3)_2.24H_2O$	15	1.52	14.45	5.17 (MgO)	66.0
	30	1.55	15.20	5.49 »	69.5
	50	1.59	16.34	5.78 »	74.4
	70	1.64	17.47	6.29 »	79.8
Neodymium manganese nitrate $2Nd(NO_3)_3.3Mn(NO_3)_2.24H_2O$	15	1.66	15.24	9.50 (MnO)	73.8
	30	1.70	15.99	10.15 »	77.4
	45	1.75	17.05	10.68 »	82.6
	60	1.82	18.37	11.48 »	89.0
Neodymium nickel nitrate $2Nd(NO_3)_3.3Ni(NO_3)_2.24H_2O$	15	1.63	14.01	9.13 (NiO)	68.4
	30	1.66	14.66	9.73 »	71.5
	45	1.69	15.41	10.12 »	75.1
	60	1.74	16.36	10.89 »	79.8
Neodymium zinc nitrate $2Nd(NO_3)_3.3Zn(NO_3)_2.24H_2O$	15	1.65	14.00	10.15 (ZnO)	69.1
	30	1.69	14.88	10.79 »	73.5
	50	1.75	15.86	11.53 »	78.3
	70	1.81	17.15	12.33 »	84.6

NEODYMIUM Potassium SULFATES.

EQUILIBRIUM IN THE SYSTEM NEODYMIUM SULFATE, POTASSIUM SULFATE AND WATER AT 25°. (Zambonini and V. Cagliotti, 1924.)

Gms. per 100 gms. sat. sol. $Nd_2(SO_4)_3$.	K_2SO_4.	Solid Phase.	Gms. per 100 gms. sat. sol. $Nd_2(SO_4)_3$.	K_2SO_4.	Solid Phase.
2.76	0.00	1.1.2	0.18	3.01	1.3.2
2.02	0.15	»	0.17	3.40	»+1.4.1
1.69	0.30	»	0.08	4.06	1.4.1
1.62	0.47	»+2.3.8	0.08	4.94	»
1.13	0.54	2.3.8	0.07	6.20	1.4.2
0.26	1.75	»	0.04	8.52	»
0.17	2.61	»	0.04	10.01	»
0.17	2.80	»+1.3.2	0.04	10.85	1.5.2
0.18	2.98	» »	0.00	11.18	»+K_2SO_4

1.1.2 = $Nd_2(SO_4)_3.K_2SO_4.2H_2O$; 2.3.8 = $2Nd_2(SO_4)_3.3K_2SO_4.8H_2O$; 1.3.2 = $Nd_2(SO_4)_3.3K_2SO_4.2H_2O$;
1.4.1 = $Nd_2(SO_4)_3.4K_2SO_4.H_2O$; 1.4.2 = $Nd_2(SO_4)_3.4K_2SO_4.2H_2O$; 1.5.2 = $Nd_2(SO_4)_3.5K_2SO_4.2H_2O$.

NEODYMIUM Sodium SULFATES.

EQUILIBRIUM IN THE SYSTEM NEODYMIUM SULFATE, SODIUM SULFATE AND WATER AT 25°. (Zambonini and Carobbi, 1925 *a*.)

Gms. per 100 gms. sat. sol. $Nd_2(SO_4)_3$.	Na_2SO_4.	Solid Phase.	Gms. per 100 gms. sat. sol. $Nd_2(SO_4)_3$.	Na_2SO_4.	Solid Phase.
2.37	0.57	$Nd_2(SO_4)_3.8H_2O$	—	9.11	4.5.8
1.11	0.14	»+1.1.2	—	8.97	»+3.4.6
0.28	0.49	1.1.2	—	10.98	3.4.6
0.14	1.24	»	—	13.16	»
—	3.11	»	—	14.54	»+2.3.5
—	5.02	»	—	16.92	2.3.5
—	6.00	4.5.8	—	17.61	»
—	7.72	»	—	17.95	»+Na_2SO_4

1.1.2 = $Nd_2(SO_4)_3.Na_2SO_4.2H_2O$; 4.5.8 = $4Nd_2(SO_4)_3.5Na_2SO_4.8H_2O$; 3.4.6 = $3Nd_2(SO_4)_3.4Na_2SO_4.6H_2O$
2.3.5 = $2Nd_2(SO_4)_3.3Na_2SO_4.5H_2O$.

EQUILIBRIUM IN THE SYSTEM NEODYMIUM SULFATE, THALLIUM SULFATE AND WATER AT 25°. (Zambonini and Cagliotti, 1925.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$Nd_2(SO_4)_3$.	Tl_2SO_4.	Solid Phase.	$Nd_2(SO_4)_3$.	Tl_2SO_4.	Solid Phase.
4.89	0.25	$Nd_2(SO_4)_3.8H_2O$+1.1.3	0.30	3.00	1.1.8
4.50	0.25	»	0.27	3.51	» +1.4½
3.84	0.26	1.1.3	0.26	3.81	»
3.81	0.27	»	0.26	3.85	1.4½
3.80	0.27	»	0.24	4.10	»
3.78	0.28	1.1.8	0.19	4.70	»
3.15	0.30	»	0.16	4.85	» +Tl_2SO_4
1.86	0.45	»	0.11	4.90	» »
0.76	1.11	»	0.09	5.02	» »

1.1.3 = $Nd_2(SO_4)_3.Tl_2SO_4.3H_2O$; 1.1.8 = $Nd_2(SO_4)_3.Tl_2SO_4.8H_2O$;
1.4½ = $Nd_2(SO_4)_3.4½Tl_2SO_4$.

NEON Ne.

SOLUBILITY OF NEON IN WATER. (von Antropoff, 1919.)

The following new determinations were made in a refined apparatus arranged so that the solvent and its vapor touched no cock, and in which other improvements were introduced. The results are given in terms of the Bunsen coefficient as modified by Kuenen, that is, in terms of the volume of gas in cc. (reduced to normal conditions) dissolved by 1 gram of H_2O.

t°.	Absorb. coef. β.	t°.	Absorb. coef. β.	t°.	Absorb. coef. β.
0.....	0.0114	20.....	0.0147	40.....	0.0217
10.....	0.0108	30.....	0.0155	50.....	0.0322

Determinations which are not in agreement with the above are given by Valentiner, 1922. This author questioned the report that neon differed from the other noble gases in showing an increase of solubility with temperature. Three series of determinations made by him agreed in showing on the contrary that the solubility of neon decreases with temperature. The results were as follows:

t°.	Cc. Neon dissolved per 1.0 gm. H_2O.	t°.	Cc. Neon dissolved per 1.0 gm. H_2O.	t°.	Cc. Neon dissolved per 1.0 gm. H_2O.
0.....	0.026	17.....	0.018	45.....	0.011

Tables showing the density and volume of neon at temperatures between 20° and —217°.52 and at pressures varying from about 22 to 90 atmospheres are given by Crommelin, Martinez and Kamerlingh-Onnes, 1919, 1920.

NICKEL Ni

Qualitative data showing that just as iron, nickel is considerably attacked by water containing carbon dioxide, with formation of nickel carbonate, are given by Robl, 1924 A few quantitative results for special conditions are given.

Data for the distribution of nickel between zinc and lead are given by Tammann and Schaftmeister, 1924.

NICKEL β MethylADIPATE.

100 cc. of sat. solution of neutral nickel racemic β methyladipate in water, contain 7.3 gms of the salt at 20°. (Meurisse.)

NICKEL AMMONIATES of the type $[Ni(NH_3)_6]X_2$.

Solubility of Several Nickel Ammoniates in a Mixture of Equal Volumes of Aqueous Ammonia ($d_{22} = 0.95$) and 96 per cent Ethyl Alcohol at 18° (Ephraim and Mosimann, 1922.)

Compound.	Formula.	Gms. empd. per liter sat. sol.	Gm. mols. empd. per liter sat. sol.
Nickel Hexamine Chlorate.....	$[Ni(NH_3)_6](ClO_3)_2$	74.75	0.228
» Nitrate.....	$[Ni(NH_3)_6](NO_3)_2$	44.55	0.156
» Chloride.....	$[Ni(NH_3)_6]Cl_2$	15.39	0.066
» Sulfate.....	$[Ni(NH_3)_6]SO_4$	14.22	0.055
» Thio sulfate...	$[Ni(NH_3)_6]S_2O_3$	12.87	0.047
» Tetrathionate.	$[Ni(NH_3)_6]S_4O_6$	11.96	0.031
» Bromide.....	$[Ni[NH_3)_6]Br_2$	7.384	0.023
» Perchlorate...	$[Ni(NH_3)_6](ClO_4)_2$	2.503	0.0069
» Iodide.....	$[Ni(NH_3)_6]I_2$	1.906	0.0046

NICKEL BENZOATE $Ni(C_6H_5COO)_2.3H_2O$.

NICKEL Chlor, Oxy and Nitro BENZOATES.

Solubility of Each Separately in Water at 20°. (Ephraim and Pfister, 1925.)

Compound.	Formula.	Gms. anhydrous empd. per 100 cc. sat. sol.
Nickel Benzoate.....	$Ni(C_6H_5.COO)_2.3H_2O$	1.291
» -4-Chlor Benzoate...	$Ni(C_6H_4.Cl.COO)_2.4H_2O$	0.660
» -4-Oxy » ...	$Ni(C_6H_4.OH.COO)_2.7H_2O$	0.871
» -4-Nitro » ...	$Ni(C_6H_4.NO_2.COO)_2.8H_2O$	0.777

NICKEL CHLORIDE $NiCl_2.6H_2O$.

Equilibrium in the System Nickel Chloride, Hydrochloric Acid and Water at 0°. (Foote, 1923.)

Saturation was secured by constant rotation. The composition of the solid phases was determined by Schreinemakers graphic method.

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$NiCl_2$.	HCl.	Solid Phase.	$NiCl_2$.	HCl.	Solid Phase.
35.27	0.0	$NiCl_2.6H_2O$	4.45	26.23	$NiCl_2.4H_2O$
26.71	6.53	»	2.92	28.82	»
15.67	14.09	»	1.37	34.57	»
9.68	18.62	»	1.40	35.03	» $+NiCl_2.2H_2O$
6.15	21.70	»	2.29	33.96	» (unstable)
5.30	23.03	»	1.57	34.7	» »
3.65	25.74	»	1.06	36.0	$NiCl_2.2H_2O$
4.02	26.16	»	0.82	37.22	»
4.56	26.00	» $+NiCl_2.4H_2O$	0.43	40.61	»

100 gms. sat. sol. of nickel chloride in selenium oxychloride ($SeOCl_2$) contain 0.15 gm. $NiCl_2$ at 25°. (Wise, 1923.)

NICKEL CINNAMATE $Ni.C_{18}H_{14}O_4.2H_2O$.

100 cc. sat. sol. of nickel cinnamate in water contain 0.293 gm. $NiC_{18}H_{14}O_4$ at 20°. (Ephraim and Pfister, 1925.)

NICKEL FUMARATE $Ni.C_4H_2O_4.5H_2O$.

100 gms. H_2O dissolve 0.36 gm. $NiC_4H_2O_4$ at 30°. (Weiss and Downs, 1923.)

NICKEL HELIANTHATE $Ni(C_{14}H_{14}N_3SO_3)_2.4H_2O$.

1000 cc. H_2O dissolve 0.072 gms. of the salt at 20-25°. (Stark and Dehn, 1918.)

NICKEL Nitroso β Phenyl HYDROXYLAMINE .

100 gms. H_2O dissolve $8.75.10^{-4}$ gm. of the compound at 18°. (Martin.)

NICKEL HYDROXIDE $Ni(OH)_2$.

Solubility of Nickel Hydroxide in Water at 20°.

(Almkvist, 1918.)

Ordinary distilled water containing a little CO_2 was used. The hydroxide was, therefore, probably converted to basic carbonate. Constant stirring was employed. Two liters of saturated solution were used for analysis. 1000 cc. sat. solution contained 0.0127 gm. $Ni(OH)_2$.

NICKEL Xylol SELENATES and SULFONATE.

Solubility of Each in Water.

(Anschütz, Kallen and Riepenkröger, 1919.)

Compound.	Formula.	t°.	Gms. anhydrous cmpd. per 100 gms. H_2O.
Nickel *o* Xylol Selenate.....	$Ni[(CH_3)_2(1,2)C_6H_3.SeO_3(4)]_2.6H_2O$	20	3.95
» *p* » »	$Ni[(CH_3)_2(1,4)C_6H_3.SeO_3]_2.7H_2O$	15	2.31
» *o* » Sulfonate.....	$Ni[(CH_3)_2(1,2)C_6H_3SO_3(4)]_2.6H_2O$	16	3.63

NICKEL SULFATE $NiSO_4.7H_2O$.

Solubility of Nickel Sulfate in Water.

(Vilbrandt and Bender, 1923: Tantzov, 1924, 1925.)

The determinations of Vilbrandt and Bender were made by a *float method.* A glass float calibrated at 25° for a nickel sulfate solution containing a definite concentration of the salt was prepared in advance. By means of this float the volume of water necessary to dilute any solution of higher but unknown concentration of nickel sulfate, to the concentration of the standard solution, could be very accurately determined. From this result the concentration of the unknown solution could be readily calculated. In the following table the results of Tantzov are designated (T).

t°.	Gms. $NiSO_4$ per 100 gms. H_2O.	Solid Phase.	t°.	Gms. $NiSO_4$ per 100 gms. H_2O.	Solid Phase.
− 4.25....	27.335	$NiSO_4.7H_2O$ (Green)	20....	40.09 (T)	$NiSO_4.6H_2O$ (Blue)
− 2.0.....	23.366	»	25....	41.56 (T)	»
0.0.....	26.189	»	30....	43.56 (T)	»
3.19....	28.884	»	31.71.	45.299	»
6.0.....	30.282	»	35.0..	45.58 (T)	»
15.65....	35.491	»	40....	47.533–47.6 (T)	»
20.0.....	37.70 (T)	»	50....	52.171	»
25.....	40.594	»	53.25.	54.041	»
25.....	40.40 (T)	»	20....	44.37 (T)	$NiSO_4.6H_2O$ (Green)
30.....	43.568	»	25....	45.36 (T)	»
30.....	43.28 (T)	»	30....	46.56 (T)	»
35.....	47.03 (T)	»	40....	49.16 (T)	»
40.....	50.42 (T)	»	58.21.	55.389	»
31.55 (tr.pt.)	– (T)	»+$NiSO_4.6H_2O$ (Blue)	60.11.	55.557	»
36.7 (tr.pt.)	– (T)	» » (Green)	79.75.	64.476	«
			94.22.	72.597	»

Equilibrium in the System Nickel Sulfate, Potassium Sulfate and Water at 25°. (Caven and Johnston, 1926.)

Gms. per 100 gms. sat. sol.		Solid Phase.	Gms. per 100 gms. sat. sol.		Solid Phase.
$NiSO_4$.	K_2SO_4.		$NiSO_4$.	K_2SO_4.	
27.94	0.00	$NiSO_4.7H_2O$	15.66	4.75	$NiSO_4.K_2SO_4.6H_2O$
27.87	3.82	»	10.15	4.11	»
27.92	6.30	»	3.90	4.15	»
27.90	8.26	»+$NiSO_4.K_2SO_4.6H_2O$	1.35	4.93	»
23.09	6.82	$NiSO_4.K_2SO_4.6H_2O$	0.33	11.16	»+K_2SO_4
19.33	5.62	»	0.0	10.59	K_2SO_4

NICKEL SULFIDE NiS.

1000 cc. of sat. solution of nickel sulfide in aqueous 2.0 normal sulfuric acid solution contain 0.0094 gm. Ni S at 20°. (See Manganese Sulfide, p. 1293).

(Moser and Behr, 1924.)

NICKEL Anthracene, Benzene and Naphthalene SULFONATES.

Solubility of Each Separately in Water.

(Ephraim and Pfister. 1925, 1925*a*; Ephraim and Seger, 1925.)

Compound.	Formula.	t°.	Gms. anhydrous cmpd. per 100 cc. sat. sol.
Nickel Anthracene–1–sulfonate	$Ni(C_{14}H_9SO_3)_2.6H_2O$	20	0.0253
» » –2– »	$Ni(C_{14}H_9SO_3)_2.6H_2O$	20	0.00463
» Benzene sulfonate	$Ni(C_6H_5SO_3)_2.6H_2O$	18	12.561
» » »	»	34	16.518
» » »	»	49.5	20.972
» » »	»	64.5	26.685
» » »	»	80.5	33.295
» » »	»	82.0	34.044
» Naphthalene–1–sulfonate	$Ni(C_{10}H_7SO_3)_2.6H_2O$	17	4.978
» » –2– »	$Ni(C_{10}H_7SO_3)_2.6H_2O$	16.5	0.2833
» » » »	»	34.5	0.5289
» » » »	»	45.5	0.7434
» » » »	»	58.5	1.1658
» » » »	»	70.5	1.5972
» » » »	»	77.0	1.9973
» » » »	»	81.5	2.4136
» » » »	»	83.0	2.6886
» » –5–Chlor–1–sulfonate	$Ni(C_{10}H_6SO_3.Cl)_2.4H_2O$	20.0	0.618
» » –6– Oxy –2– »	$Ni(C_{10}H_6SO_3)_2.8H_2O$	20.0	0.529

NICKEL Naphthylamine DiSULFONATES $Ni.C_{10}H_5(NH_2)(SO_3)_2$, 2.6.8 and 2.5.7.

100 gms. sat. solution of nickel naphthylamine disulfonate 2.6.8 in water contain 33.2 gms. of the anhydrous compound at 15°. An aqueous solution of the 2.5.7 compound contains 35.5 gms. per 100 gms. sat. solution at 15°.

(Braunschweig, 1922, 1926.)

NICOTINE $C_{10}H_{14}N_2$.

The temperature of clouding of various mixtures of nicotine and aqueous solutions of sodium hydroxide, sodium sulfate and hydrochloric acid was determined by Dubrisay, 1922. The results were used in the study of certain reactions. When plotted, a change in direction of the curve was found to occur at the point of neutralization. The presence of acids, bases and salts was shown to modify considerably the miscibility of liquid pairs.

The formation of hydrates of nicotine and their decomposition at higher temperatures is suggested by Jephcott, 1919, as the explanation of the true nature of the « closed curve of solubility. »

NITRIC ACID.

Freezing-Points of Aqueous Nitric Acid Solutions.

(Klein and Svanberg, 1920.)

t° of f. pt.	Normality of aq. HNO_3.	t° of f. pt.	Normality of aq. HNO_3.	t° of f. pt.	Normality of aq. HNO_3.
—0.356.....	0.10	—0.885.....	0.25	—1.797.....	0.50

Freezing-point data for mixtures of nitric acid and sulfuric acid, with and without the presence of water are given by Holmes, 1920.

RECIPROCAL SOLUBILITY OF NITRIC ACID AND NITROGEN PEROXIDE (N_2O_4).
(Pascal and Garnier, 1919.)

Thermic analysis was used for determination of the solubility at very low temperatures and for the detection of the internal transformations in the system.

t°	Gms. HNO_3 per 100 gms. mixture.	Solid Phase.
−42.....	100.0	HNO_3
−58.5.....	90.6	»
−70.....	85	»
−73 (Eutec.)	82	»+N_2O_4 (Solid)
−58.5.....	70	N_2O_4 (solid)
−48.5	66	»
32.....	62	»
−21.4.....	60	»

Solubility, in the Liquid State, of :

N_2O_4 in HNO_3. t°	Gms. HNO_3 per 100 gms. mixture.	HNO_3 in N_2O_4. t°	Gms. HNO_3 per 100 gms. mixture.
−11.....	52.0	−13.25.....	2.75
− 0.8.....	50	− 5.0.....	4.20
+15.....	45	+ 5.0.....	5.20
20.....	44.3	19.5.....	7.15
35.....	37.5	40.0.....	10.0
50.....	30	55.0.....	20.0

Determinations of the compositions of the two liquid layers which are formed in the system nitric acid and nitrogen peroxide at certain temperatures, were made by Bousfield, 1919, by means of density measurements, and the following results were obtained.

N_2O_4 in HNO_3. t°	Density of mixture.	Specific volume.	Per cent HNO_3.	HNO_3 in N_2O_5. t°	Density of mixture.	Specific volume.	Per cent HNO_3.
4.0...	1.65432	0.60448	45.6	4.0...	1.48742	0.67231	4.90
11.0...	1.63942	0.60997	45.7	11.0...	1.47351	0.67865	6.67
18.0...	1.62501	0.61538	46.0	18.0...	1.45940	0.68521	8.05

NITROCELLULOSE.

Experiments upon the solubility of nitrocellulose in mixtures of alcohol and ether are described by de Bruin, 1921, and in mixtures of alcohol and ethylacetate by Wilkie, 1921. It was found by de Bruin that the solubility decreased as the per cent of nitrogen in the sample increased. 384 samples were tested with the following results.

Mean per cent of N..	11.38	12.25	12.45	12.64	12.74	12.85	12.93	13.19
Mean solubility.....	97.5	95.6	85.6	66.8	48.2	34.3	23.8	8.2

The exact terms in which the results are given are not-stated. The solvent consisted of approximately 33 vol. per cent C_2H_5OH and 66 vol. per cent $(C_2H_5)_2O$. It was found by Wilkie that four different samples of nitrocellulose each showed a slight maximum solubility in a mixture of about 60 per cent ethyl acetate in alcohol, but the differences between the several samples were greater than the variations in solubility of any sample in increasing concentrations of ethyl acetate in alcohol.

NITROGEN N_2.

Extensive data upon the rate of solution of atmospheric nitrogen and oxygen in water are given in a series of papers by Adeney and Becker, 1916-1920, 1919, 1920 and 1921. One of the methods of experimenting consisted in inclosing a large bubble of air, of known volume, in a narrow tube containing deaerated water, and allowing the bubble to pass up through the water repeatedly untill saturation was reached. From the figures given it is possible to calculate the rate of solution for any condition of area exposed, depth, or degree of saturation.

Solubility of Atmospheric Nitrogen and Oxygen in Aqueous Ammonium Chloride Solutions. (Coste and Andrews, 1924.)

In attempting to explain the unexpected results of Mac Arthur (*J. Phys. Chem.*, 20, 495, 1916) upon the solubility of atmospheric air in ammonium chloride solutions, the authors found that the trouble was with the method of analysis. New determinations were made as follows.

Solutions of ammonium chloride in distilled water were subjected to a stream of air for some hours and then examined (1) by the Winkler manganous process and (2) by the Winkler gasometric process (*Z. anal. Chem.*, 40, 523, 1901) in which the oxygen and nitrogen dissolved in the water are evolved by a current of CO_2 generated in the water from calcite by means of hydrochloric acid. The following results were obtained :

Molar conc. of the NH_4Cl solution.	t° of saturation with air.	Dissolved gases in cc. per liter: Gasometric process: Nitrogen + Argon.	Gasometric process: Oxygen.	Manganous process: Oxygen.
0.5	20	10.65	5.48	5.46 (18 hrs.)
1.0	20	10.29	5.08	—
1.0	19	10.15	5.70	2.6 (20 hrs.)
2.0	22	7.79	3.93	1.6 (over night)

Although highest accuracy is not claimed for the results they show that the solubility of air in aqueous ammonium chloride is very different from that given by Mac Arthur. They also demonstrate the inapplicability of the manganous process in presence of large amounts of ammonium salts.

Solubility of Nitrogen in Serum, Plasma and Haemoglobin Solutions.

Solvent.	t°.	Cc. N_2 per 100 cc. solvent.	Authority.
Water	20	1.561	(Stoddard, 1927.)
Plasma proteins, series 1	20	1.5168	»
» » 2	20	1.5156	»
Haemoglobin solutions	20	1.613	»
Blood Plasma	15	1.7	(O'Brien and Parker, 1922;
»	38	1.2	» quoted from Bohr, 1905.)
Whole Blood	15	1.6	» »
»	38	1.1	» »
Blood Corpuscles	15	1.4	» »
»	38	1.0	» »

100 cc. rubber dissolve 3.5 cc. nitrogen (reduced to 0° and 760 mm.) at 21°. The dissolved gas was pumped out with a Töpler pump and measured over mercury. (Venable and Fuwa, 1922.)

NITROGEN OXIDE (ic) NO.

Solubility of Nitric Oxide in Aqueous Solutions of Sulfuric Acid at 0°.

(Manchot and Reinburger, 1926.)

Gms. H_2SO_4 per 100 gms. sol.	Cc. NO dissolved per 100 gms. sol.	Cc. NO dissolved per 100 cc. sol.	Gms. H_2SO_4 per 100 gms. sol.	Cc. NO dissolved per 100 gms. sol.	Cc. NO dissolved per 100 cc. sol.
0.0	7.38	7.38	76.7	1.8	3.1
8.8	6.5	6.9	78.0	1.9	3.2
18.2	5.2	5.9	88.3	2.0	3.5
28.0	4.5	5.4	89.1	2.1	3.7
38.6	3.8	4.9	90.0	2.3	4.1
48.0	2.9	4.0	90.4	2.4	4.3
52.6	2.4	3.4	91.9	2.4	4.3
58.7	2.2	3.3	92.4	2.5	4.6
66.5	1.9	3.0	95.0	3.8	7.1
70.8	1.9	3.0	95.9	4.2	7.7

The values are given with reference to the Dalton law.

Data for the solubility of nitric oxide in nitrosyl chloride (NO Cl), pentane and in toluene are given by Trautz and Gerwig, 1925.

NITROGEN OXIDE (ous) N_2O.

Solubility of Nitrous Oxide in Aqueous Solutions of Salts at 25°.
(Manchot, Jahrstorfer and Zepter, 1924.)

See note, p. 1016, for details as to the method of determination and terms used for expressing the results.

Salt.	d_4^{25} of salt solution.	Gms. anhy. salt per 100 cc. solution.	Abs. coef. α for 100 cc. solution.	Salt.	d_4^{25} of salt solution.	Gms. anhy. salt per 100 cc. solution.	Abs. coef. α for 100 cc. solution.
None (=H_2O).	–	0.0	53.14	$Mg(NO_3)_2$.	1.0935	14.389	39.2
NH_4Cl.....	1.0146	5.724	46.6	»	1.1846	28.630	28.5
»	1.0312	12.037	41.1	$Ca(NO_3)_2$..	1.1503	22.398	32.2
»	1.0594	23.005	34.7	»	1.2927	44.796	19.4
KCl.....	1.0334	5.8157	45.3	$Zn(NO_3)_2$.	1.1223	15.909	39.7
»	1.0540	9.3200	41.0	»	1.2433	31.818	29.1
»	1.0850	14.763	35.5	$Cd(NO_3)_2$.	1.1435	18.465	35.0
»	1.1385	23.934	28.1	»	1.2874	36.93	27.0
»	1.1734	30.123	24.0	$Cu(NO_3)_2$.	1.1028	12.944	35.6
NaCl.....	1.0438	6.723	39.0	»	1.2049	25.888	27.8
»	1.0874	13.504	28.5	$Al(NO_3)_3$.	1.0703	10.22	36.1
»	1.1600	25.255	17.2	»	1.1414	20.44	29.3
$CaCl_2$.....	1.0786	10.322	33.9	$(NH_4)_2SO_4$.	1.0896	17.786	27.1
»	1.1665	22.087	20.2	»	1.1393	28.807	17.5
$BaCl_2$.....	1.1090	12.914	37.4	K_2SO_4....	1.0762	10.440	35.5
»	1.2290	27.348	26.1	Na_2SO_4....	1.0550	6.600	36.5
NH_4Br.....	1.0535	10.225	47.4	»	1.1141	13.879	24.8
»	1.1088	20.745	42.3	$MgSO_4$...	1.0992	10.835	29.5
»	1.2122	40.803	35.8	»	1.1925	21.430	15.9
KBr.....	1.0891	13.211	43.0	$ZnSO_4$....	1.1403	15.337	29.9
»	1.1752	25.590	35.1	»	1.2699	29.705	16.9
»	1.3380	49.969	24.7	$MnSO_4$...	1.1226	14.194	30.6
NaBr.....	1.0849	11.578	40.1	»	1.2460	29.143	17.0
»	1.1645	22.334	30.9	$FeSO_4$....	1.1017	10.938	34.0
»	1.3338	45.992	17.8	»	1.2011	21.845	21.6
NH_4NO_3.....	1.0249	7.125	49.8	$CoSO_4$....	1.1131	12.217	27.5
»	1.0527	14.809	46.4	»	1.2218	24.433	17.1
»	1.1040	29.058	40.9	$NiSO_4$....	1.1355	14.499	24.6
»	1.2116	54.236	30.8	»	1.2642	28.998	13.8
KNO_3.....	1.0586	10.313	44.8	$Al_2(SO_4)_3$.	1.1558	17.688	22.4
»	1.1231	21.739	38.3	»	1.2381	27.875	13.4
$NaNO_3$	1.0560	9.181	42.3	$Fe_2(SO_4)_3$.	1.2240	26.390	25.9
»	1.0677	11.136	40.3	»	1.4319	52.781	13.1
»	1.1141	18.447	33.5	$Cr_2(SO_4)_3$.	1.1657	22.356	31.8
»	1.1543	25.588	27.7	»	1.3280	44.712	18.2
»	1.2152	35.704	21.6	Na_2HPO_4.	1.0470	5.661	37.6
				Na_3PO_4...	1.0348	3.6088	40.7
				KIO_4.....	1.0008	0.3608	52.1

Solubility of Nitrous Oxide (N_2O) in Aqueous Solutions of Acids at 25°.

(Manchot, Jahrstorfer and Zepter, 1924; See Note, p. 1016.)

Acid.	$d_{\frac{25}{4}}$ of aq. acid.	Gms. acid per 100 cc. sol.	Abs. coef. a per 100 cc. sol.	Acid.	$d_{\frac{25}{4}}$ of aq. acid.	Gms. acid per 100 cc. sol.	Abs. coef. a per 100 cc. sol.
HNO_3...	1.0351	6.932	54.1	H_2SO_4...	1.0680	11.084	44.2
» ...	1.0731	14.242	55.1	» ...	1.1630	26.974	38.7
» ...	1.1191	22.938	56.2	» ...	1.2687	45.415	38.2
HCl.....	1.0168	3.9387	51.2	» ...	1.3363	58.853	39.9
»	1.0335	7.7318	50.1				
»	1.0741	16.703	49.9	H_3PO_4...	1.0593	11.473	46.4
»	1.1050	23.706	52.1	» ...	1.0964	18.631	43.8
HIO_4....	1.1740	20.421	38.7	» ...	1.2557	49.520	35.3
»	1.4066	47.023	23.8				

Solubility of Nitrous Oxide in Aqueous Solutions of Urea at 25°.

(Manchot, Jahrstorfer and Zepter, 1924; See Note, p. 1016.)

$d_{\frac{25}{4}}$ of aq. sol. of Urea.	Mol. $CO(NH_2)_2$ per 1000 cc. sol.	Abs. coef. a per 100 cc. sol.
1.0134.....	0.97	51.0
1.0287.....	1.95	49.2
1.0619.....	4.05	46.3
1.0905.....	5.89	44.5

Solubility of Nitrous Acid in Water and in Organic Solvents.

(Kunerth, 1922.)

An apparatus similar to that of Mc Daniel (*J. Phys. Chem.*, 15, 587, 1911) was used. The N_2O was frozen by means of liquid air and ethyl alcohol and all other gases pumped off. The N_2O sublimed from the frozen gas was dried over P_2O_5. Its density was found to be 1.968 gms. per liter at standard temp. and pressure. In the present determinations the N_2O was sat. with the vapor of the solvent before being shaken with the solvent for the solubility determination. Hence it was not necessary to allow for the vapor pressure of the solvent.

Cc. N_2O dissolved ger 1 cc. solvent (both at same temp. and pressure) at

Solvent.	18°.	20°.	22°.	24°.	26°.	28°.	30°.	32°.	34°.	36°.
(1)...	0.703	0.675	0.638	0.617	0.587	0.561	0.530	0.513	0.478	0.449
(2)...	6.30	6.03	5.78	5.50	5.21	4.84	4.46	4.07	3.66	3.26
(3)...	5.00	4.85	4.70	4.55	4.39	4.25	4.11	3.98	3.84	3.75
(4)..,	–	3.58	3.50	3.45	3.34	3.25	3.17	3.10	3.02	2.94
(5)...	3.38	3.32	3.27	3.23	3.19	3.07	2.98	2.88	–	–
(6)...	3.07	2.99	2.91	2.85	2.77	2.68	2.61	2.52	2.43	2.33
(7)...	3.23	3.15	3.07	3.00	2.93	2.85	2.78	2.72	2.65	2.57
(8)...	1.50	1.48	1.45	1.42	1.40	1.37	1.35	1.32	1.31	1.28
(9)...	5.24	5.14	5.05	4.93	4.83	4.71	4.60	4.49	4.39	4.30
(10)...	2.87	2.81	2.75	2.69	2.64	2.58	2.52	2.46	2.42	2.37
(11)..	2.52	2.47	2.43	2.37	2.32	2.27	2.24	2.19	2.16	2.12
(12)...	5.70	5.60	5.51	5.26	5.07	4.83	4.57	4.29	4.03	3.70

(1) Water.
(2) Acetone.
(3) Acetic acid.
(4) Pyridine.
(5) Methyl Alcohol.
(6) Ethyl Alcohol.
(7) Benzaldehyde.
(8) Aniline.
(9) Amyl Acetate.
(10) Ethylene Bromide.
(11) Iso Amyl Alcohol.
(12) Chloroform.

NITROGEN PEROXIDE N_2O_4.

FREEZING-POINTS OF MIXTURES OF NITROGEN PEROXIDE AND NITROGEN TRIOXIDE.
(Baume and Robert, 1919.)

An apparatus made entirely of glass was used. The vapor tension of the mixture $N_2O_4 + N_2O_3 + NO$ was also determined. Pure nitrous anhydride (N_2O_3) exists in the solid or liquid state under pressure of NO only at very low temperatures. Above — 100° it dissociates and the liquid phase gets richer in N_2O_4 and the gaseous in NO. A single eutectic, near the freezing-point of N_2O_3 was found for the system $N_2O_4 + N_2O_3$.

t° of f. pt.	Wt. per cent N_2O_3 in mixture.	t° of f. pt.	Wt. per cent N_2O_3 in mixture.	t° of f. pt.	Wt. per cent N_2O_3 in mixture.
—11.5....	0.0	—27.1....	33.8	— 50.....	59.7
—15.6....	10.9	—31.0....	37.6	— 75.0....	73.4
—19.9....	18.9	—34.0....	42.9	— 92.....	80.1
—20.5....	20.2	—37.5....	45.9	—107.....	86.3
—22.0....	23.5	—41.5....	51.9	—107.....	91.8
—26.0....	30.4	—43.0....	53.4	—100.....	97.0

NITRON $C_{20}H_{16}N_4$.

100 gms. carbon tetrachloride dissolve 2.55 gms. nitron at 20° (Pawlewski, 1914, 1926.)
» chloroform » 0.03 » »

NITROSYL SULFURIC ACID $HO.SO_2.O.NO$.

SOLUBILITY OF NITROSYL SULFURIC ACID IN STRONG SOLUTIONS OF SULFURIC ACID:
(Elliott, Kleist, Wilkins and Webb, 1926.)

Constant agitation in a thermostat was employed.

	Gms. $HO.SO_2.O.NO$ per 100 gms. sat. solution in aq. H_2SO_4 of						
t°	56.7 %	62.1 %	73.1 %	74.9 %	84.1 %	90.4 %	99.8 %
0.....	–	11.9	17.3	19.7	30.5	35.1	–
20.9...	19.3	22.6	27.0	31.4	42.4	49.2	62.0
37.3...	29.9	34.3	39.4	40.8	50.2	58.5	66.1
49.6...	35.6	39.3	46.4	46.2	56.5	61.6	67.8

OCTANE $CH_3(CH_2)_6CH_3$.

100 cc. H_2O dissolve approx. 0.002 cc. octane at 16° (Fühner, 1924.)

MUTUAL SOLUBILITY OF NORMAL OCTANE AND SULFUR DIOXIDE.
(Seyer and Gallaugher, 1926.)

t°	—49.7.	—18.6.	+0.7.	19.81.	26.85.	24.25.	—3.6.	—10.8.
Wt. % C_8H_{18}.....	96.34	87.44	76.95	61.37	50.0	17.26	3.39	2.42

OCTYL ALCOHOL (Secondary) $CH_3(CH_2)_5CHOH.CH_3$.

By means of a new optical method, involving the use of an interferometer of the type described by Janin (*Ann. chim. phys.*, 52, 171, 1858), it was found that 1000 cc. of H_2O dissolve 1.508 gms. sec. octyl alcohol at 15° and 1.280 gms. at 25°
(Mitchell, 1926.)

OENANTHOL $CH_3(CH_2)_5CHO$.

FREEZING-POINTS OF MIXTURES OF OENANTHOL AND WATER. (Noorduyn, 1919.)

t° of f. pt.	Mol. per cent $C_7H_{14}O$ in mixture.	Solid Phase.
—42.....	100	$C_7H_{14}O$
—42.5 (Eutec.).....	trace H_2O present	» + $C_7H_{14}O.H_2O$
+11.4.....	90	$C_7H_{14}O.H_2O$ + two liquid layers
+11.4.....	0.019	» + »
— 0.058 (Eutec.)....	0.016	$C_7H_{14}O.H_2O$ + Ice
0.0.....	0.0	Ice

The solubility of oenanthol in water at 11°.4 was found to be 0.124 gm. (=0.019 gm. mol.) $C_7H_{14}O$ per 100 gms. sat. sol.

Solubility of Several Volatile Oils in Aqueous Alcohol at 22-25°.

(Wood, 1920.)

The determinations were made by gradually adding water to an alcoholic solution of the oil untill opalescence appeared Since the volatile oils are mixtures the results are of only approximate accuracy.

Per cent concentration of alcohol.	Cc. of each oil (determined separately), soluble in 100 cc. of alcohol of the concentration shown in the first column.					
	Anise oil.	Cinnamon oil.	Clove oil.	Eugenol.	Peppermint oil.	Sassafras oil.
30	0.05	–	0.02	–	0.02	0.07
40	0.08	–	0.10	0.30	0.02	0.10
50	0.10	0.20	0.40	5.8	0.03	0.20
60	0.25	0.40	2.0	16.0	0.06	1.30
65	0.80	1.10	10.0	–	0.07	2.30
70	1.50	2.20	21.75	–	0.10	4.00
75	4.00	7.0	–	–	0.17	7.00
80	7.5	–	–	–	0.35	11.00

Reciprocal Solubility of Several Oils and Fats in Liquid Sulfur Dioxide.

(Weisz and Opalski, 1922.)

Mixtures of weighed amounts of the oils and sulfur dioxide were sealed in high pressure glass tubes and the temperatures determined at which the mixture just became homogeneous or just showed a faint clouding. The sulfur dioxide contained 98.85 % SO_2 + 0.56 % H_2O + 0.67 % oily residue.

Castor oil + SO_2.		Lin seed oil + SO_2.		Rape seed oil + SO_2.		Olive oil + SO_2.	
t° of demixing.	Per cent oil in mixture.	t° of demixing.	Per cent oil in mixture.	t° of demixing.	Per cent oil in mixture.	t° of demixing.	Per cent oil in mixture.
19....	2.05	– 6.25..	2.99	39.75..	4.41	28.5..	7.95
– 8....	7.23	+ 0.5...	7.79	45.5...	10.94	34.0..	11.19
–11.5..	28.74	– 2.0...	22.49	44.5...	26.22	8.5..	47.86
–21.0..	54.31	– 6.75..	37.79	18.0...	47.56	–21.5..	79.07
–21.5..	63.04	–14.0...	64.50	7.75..	52.17		
–22....	86.82	–16.0...	70.85	± 0.0...	80.34		

Tallow + SO_2.		Bone oil + SO_2.		Oleic acid + SO_2.		Stearin + SO_2.	
t° of demixing.	Per cent tallow in mixture.	t° of demixing.	Per cent oil in mixture.	t° of demixing.	Per cent oleic acid in mixture.	t° of demixing.	Per cent stearin in mixture.
21.75..	1.10	15.5....	1.87	14.....	4.43	34.....	6.72
43.75..	10.97	35.75...	25.72	22.....	9.84	37.....	8.86
25.5...	43.07	28.75...	37.64	22.5....	18.26	37.5...	13.82

It is ponited out by Fontein, 1923, that the H_2O in the SO_2 used, affects the temperature of demixing.

OLEIC ACID $C_8H_{17}CH : CH(CH_2)_7COOH$.

Solubility of Oleic Acid in Several Solvents at 0°. (Lebrun, 1925.)

Solvent.	B. pt. of solvent.	Gms. $C_{18}H_{34}O_2$ per 100 gms. solvent.
Dichlor acetylene (cis).....	60°.2	>100
» » (trans).....	48°.3	>100
Ethyl chloroisocrotonate.....	-	>100
Bromo butene 2.....	85°.5-85°.6	>100
» » -2.....	93°.9	>100
Crotonic nitrile.....	107°.7-108°.2	39.1
» »	121°.8-122°.2	30.2

OXALIC ACID $H_2C_2O_4.2H_2O$.

SOLUBILITY OF OXALIC ACID AT 25° IN AQUEOUS SOLUTIONS OF :
(Knox and Richards, 1919.)

Acetic Acid. Equiv. Normalities.		Formic Acid Equiv. Normalities.		Lactic Acid. Equiv. Normalities.	
CH_3COOH.	$H_2C_2O_4$.	$HCOOH$.	$H_2C_2O_4$.	$CH_3CHOHCOOH$.	$H_2C_2O_4$.
0.135	2.356	0.097	2.382	0.0	2.409
0.321	2.361	0.437	2.385	1.337	2.228
0.923	2.395	0.967	2.411	2.718	2.054
1.361	2.402	1.287	2.414	4.051	1.856
1.844	2.401	1.825	2.441	5.357	1.633
3.563	2.351	2.678	2.430	6.477	1.412
5.721	2.168	5.360	2.326	7.647	1.171
8.005	1.839	8.13	2.131	8.709	0.938
9.864	1.546	11.00	1.868	9.52	0.832
12.55	1.100	12.17	1.758		
14.03	0.896	16.63	1.496		
14.21	0.875	19.25	1.568		
14.83	0.802	21.11	2.339		

SOLUBILITY OF OXALIC ACID AT 25° IN AQUEOUS SOLUTIONS OF :
(Herz and Neukirch, 1923.)

Hydrochloric Acid. Mols. per liter				Nitric Acid Mols. per liter			
HCl.	$H_2C_2O_4$.	HCl.	$H_2C_2O_4$.	HNO_3.	$H_2C_2O_4$.	HNO_3.	$H_2C_2O_4$.
0.708	0.884	5.098	0.424	0.00	1.181	9.054	0.495
0.996	0.795	5.370	0.414	1.032	0.894	9.830	0.502
1.562	0.699	6.662	0.419	2.962	0.703	11.798	0.528
2.247	0.605	6.820	0.423	4.676	0.605	11.778	0.537
3.191	0.517	7.356	0.434	5.914	0.554	14.064	0.708
3.380	0.499	8.228	0.479	7.380	0.530		
4.476	0.441	9.170	0.568				

SOLUBILITY OF OXALIC ACID AT 25° IN AQUEOUS SOLUTIONS OF SULFURIC ACID.
(Average results of Knox and Richards, 1919, and Herz and Neukirch, 1923.)

Equiv. Normalities		Equiv. Normalities		Equiv. Normalities.	
H_2SO_4.	$H_2C_2O_4$.	H_2SO_4.	$H_2C_2O_4$.	H_2SO_4.	$H_2C_2O_4$.
0.0	2.38	6.0	0.85	12.0	0.69
1.0	1.90	7.0	0.76	13.0	0.76
2.0	1.54	8.0	0.70	14.0	0.87
3.0	1.31	9.0	0.66	15.0	1.00
4.0	1.11	10.0	0.65	16.0	1.30
5.0	0.97	11.0	0.66	17.0	1.80

100 cc. sat. sol. of Oxalic acid in water contain 10.4 gms. $H_2C_2O_4$ at 23°.5. } (Schilow and
» » ether » 1.37 » » } Lepin, 1922.)

DISTRIBUTION OF OXALIC ACID BETWEEN WATER AND ETHER :

At 19° (Schilow and Lepin, 1922.) Gms. $H_2C_2O_4$ per 100 cc.		At 25° (Smith, 1921, 1922.) Millimols. $H_2C_2O_4$ per liter.		
H_2O layer.	$(C_2H_5)_2O$ layer.	H_2O layer (C_1).	$(C_2H_5)_2O$ layer C_2.	$\frac{C_2}{C_1}$.
0.594	0.0322	5.9375	0.525	0.0885
1.298	0.0792	14.10	1.31	0.0930
2.600	0.1830	22.625	2.0375	0.0902
4.970	0.4140	39.35	3.80	0.0965
10.50	1.06*	84.25	9.60	0.113

* Solid Phase present.

OXYGEN O_2.

Solubility of Oxygen in Water.

A table showing the solubility of oxygen in water in contact with air at various temperatures between 5° and 30° and at absolute pressures from 0 to 760 mm mercury is given by White, 1919. The results are based upon the tables of Roscoe and Lunt and Henry's law. They are given in terms of milligrams of oxygen per liter and are intended for practical application in industrial problems.

Extensive data upon the rate of solution of atmospheric oxygen and nitrogen in water are given in a series of papers by Adeney and Becker 1916-1920, 1919, 1920 and 1921. See also remarks under Nitrogen, p. 1317.

100 cc. H_2O dissolve 3.0 cc. oxygen (reduced to 0° and 760 mm.) at 21°.
(Venable and Fuwa, 1922.)

Solubility of Oxygen in Various Organic Solvents
(Fischer and Pfleiderer, 1922.)

The determinations were made by two procedures for which highest accuracy is not claimed but which yield comparative values of much interest. (1) An autoclave of known volume is nearly filled with a measured amount of the solvent. The apparatus is shaken and oxygen introduced untill a constant pressure of the gas is reached. The pressure is then released to one atmosphere and the volume of liberated gas is measured. By calculating from the total pressure, the volume of free space above the solvent and the volume of liberated gas, a value for the solubility is obtained. The correction for vapor pressure of solvent is relatively small by this method. (2) The solvent is saturated in an autoclave under known pressure by means of a gas outlet under the liquid. A sample of the saturated solution is withdrawn, its volume or weight determined and its dissolved gas released and measured in a gas buret.

Solvent.	d of solvent.	Vaper pressure of solvent		t° of saturation.	Abs. coef. α.	Solubility l (Ostwald).
		mm.	t°.			
Water	1.00	19	21.3	20	0.021	0.023
Aq. 0.1 n KOH	1.004	18	20.3	20	0.024	0.026
Petroleum Ether (b. pt. >65°)	0.668	348	18.5	18.5	0.409	0.436
Benzine (b. pt. 65°–100°)	0.709	115	20	18	0.292	0.312
Com. Petroleum	0.809	4.4	19	18	0.159	0.170
Paraffine Oil	0.8805	–	17	18	0.114	0.122
Chloroform	1.49	136	16	16	0.205	0.217
Carbon Tetrachloride	1.595	86	17.8	18	0.230	0.245
Acetylene » ($C_4H_4Cl_4$)	1.602	7	18	18	0.100	0.107
Methyl Alcohol	0.792	96	20	18.5	0.175	0.187
Ethyl Alcohol (96 %)	0.809	(35-40)	20	20	0.143	0.154
Amyl Alcohol (iso)	0.812	2	17	16	0.163	0.173
Acetone	0.795	165	18	19	0.207	0.222
Ethyl Ether	0.718	434	20.2	20.2	0.415	0.446
Ethyl Acetate	0.868	73	20	20	0.163	0.175
Benzene	0.8785	74.5	19.8	19	0.163	0.174
Toluene	0.864	21	18.5	18	0.168	0.179
Xylene (Com.)	0.865	8.4	16	16	0.169	0.179
Nitrobenzene	1.202	–	20	18	0.070	0.075
Tetra hydro naphthalene (Tetralin)	0.98	–	–	17	0.094	0.100
Pyridine	0.981	12	18.5	18	0.099	0.105

The Abs. Coef. α is the volume of gas dissolved in 1 cc. of solvent when its partial pressure is 1 atmosphere (reduced to normal conditions of 0° and 760 mm.). The Ostwald solubility expression l is the volume of gas per 1 volume of liquid, on the basis of Henry's law, measured at the saturation temperature. The results for water are probably in error due to removal of oxygen by oxidation of the iron of the autoclave.

Solubility of Oxygen in Plasma and in Blood.

(O'Brien and Parker, 1922, quoted from Bohr, 1905.)

Solvent.	Coef. abs. α (cc. O_2 per cc. solvent, at 0° and 760^{mm}). at 15°.	at 38°.
Blood plasma	0.033	0.023
Whole blood	0.031	0.022
Blood corpuscles	0.025	0.019

100 cc. rubber dissolve 7.3 cc. oxygen (reduced to 0° and 760 mm.) at 21°. The gas dissolved by a given amount of air free rubber was pumped out with a Töpler pump and measured over mercury. (Venable and Fuwa, 1922.)

PALMITIC ACID $CH_3(CH_2)_{14}COOH$.

Solubility of Palmitic Acid in Carbon Tetrachloride and in Carbon Tetrachloride Solutions of Laurinic Acid at 0°.

(Waentig and Pescheck, 1919.)

Gms. Laurinic Acid per 100 gms. CCl_4.	Gms. $CH_3(CH_2)_{14}COOH$ per 100 gms. sat. sol.	Gms. Laurinic Acid per 100 gms. CCl_4.	Gms. $CH_3(CH_2)_{14}COOH$ per 100 gms. sat. sol.
0.0 (= CCl_4 alone)	0.471*	3.312	1.5093
0.0 »	0.5457	4.296	1.7260
0.984	1.0080	5.214	1.8111
2.150	1.2644	5.821	1.8579

* It appears probable that in this case saturation was approached from below and all the others from above.

Solubility of Palmitic Acid in Several Solvents at 25°.

(Kröber, 1919.)

Solvent.	Gms. $CH_3(CH_2)_{14}COOH$ per 100 gms. solvent.	Gms. $CH_3(CH_2)_{14}COOH$ per 100 cc. solvent.	Solvent.	Gms. $CH_3(CH_2)_{14}COOH$ per 100 gms. solvent.	Gms. $CH_3(CH_2)_{14}COOH$ per 100 cc. solvent.
Methyl formate	2.5	2.3	Methyl butyrate	10.0	8.9
» acetate	7.8	7.2	Ethyl »	10,5	9.1
Ethyl »	10.7	9.6	Propyl »	10.6	9.2
Amyl »	16.6	14.3	Ethyl ether	32.8	23.2
Methyl propionate	9.9	9.6	» alcohol	11.0	9.4
Ethyl »	10.5	9.3	» chlor acetic acid.	1.1	1.3

The author does not describe the method used and does not claim high accuracy for the results.

PALMITIC ANHYDRIDE $(C_{15}H_{31}CO)_2O$.

100 gms. abs. alcohol dissolve 0.18 gm. $(C_{15}H_{31}CO)_2O$ at 20°. (Whitby, 1926.)

PAPAVERINE $C_{20}H_{21}NO_4$.

100 gms. quinoline dissolve 7.66 gms. papaverine at 20-25°.

(Pucher and Dehn, 1921.)

PAPAVERINE PICRATE $C_{20}H_{21}NO_4.OH.C_6H_2(NO_2)_3$.

100 gms. sat. sol. of papaverine picrate in water contain 0.007 gm. of the cmpd at 20°.

» » » » » acetone » 1.81 » » »

» » » » »abs. alcohol» 0.052 » » »

(Mapplethorpe and Evers, 1925.)

PARAFFINS.

Data for the solubility of several samples of paraffin in a large number of solvents are given by Sachanen, 1925. The samples of paraffin varied in melting-point from 41°-42°, 53 1/2°-55°, 56°-57°, 57°-58 1/2 and 78°-80°. The solvents included benzine, kerosene, paraffin oil of several densities, machine oil, mazout (containing and free from paraffin) benzoin, abs. alcohol, methyl alcohol and iso amyl alcohol. In each case the solubility begins at less than 1 per cent at a temperature of 0° or less and rises very rapidly to 50 per cent or more with increase of temperature to about 50°.

PARALDEHYDE $(CH_3.CHO)_3$.

RECIPROCAL SOLUBILITY OF PARALDEHYDE AND WATER. (Pascal and Dupuy, 1920.)

Mixtures of paraldehyde and water were cooled or rewarmed while being energetically agitated and the temperature of appearance or disappearance of clouding determined to within 0°.5. At temperatures above 50° it was necessary to renew the mixture for each determination to avoid the production of a small amount of aldehyde. The paraldehyde was purified by drying and recrystallizing many times untill the fusion-point became constant at 12°.4. It contained so little aldehyde that it scarcely gave a coloration with Schiff's reagent.

Solubility of Liquid Paraldehyde in Water

(Mixtures containing an excess of H_2O).

t° of clouding or clearing.	Gms. Paraldehyde per 100 gms. of solution.
8.5.....	13.25
11.5.....	12.45
12.0.....	12.30
13.5.....	11.90
17.0.....	11.20
27.0.....	9.10
40.0.....	7.65
42.5.....	7.45
68.0.....	6.00
75.0.....	5.80
Ice curve.	
—1.53.....	9.37
—1.99.....	13.10
Solid Paraldehyde Curve.	
1.71 (Eutec.).	11.8
<5.0.....	12.27
6.0.....	12.45
9.5.....	12.70

Solubility of H_2O in Paraldehyde

(Mixtures containing a large excess of Paraldehyde).

t° of clouding or clearing.	Gms. H_2O per 100 gms. of solution.
85.0.....	3.50
63.0.....	2.45
46.0.....	1.75
28.5.....	1.30
19.0.....	1.05
14.5.....	0.95
10.5.....	0.90
6.5.....	0.80
F. pt. of H_2O in Paraldehyde.	
9.78.....	1.15
10.02.....	0.88*
10.28.....	0.635

* The curve of the f. pt. cuts the solubility curve at 10°.02 and 0.88 % H_2O. This is the f. pt. of moist paraldehyde.

SOLUBILITY OF PARALDEHYDE IN DILUTE SULFURIC ACID (5.15 % H_2SO_4).

t° of clouding or clearing.	Gms. Paraldehyde per 100 gms. sol.	t° of clouding of clearing.	Gms. Paraldehyde per 100 gms. sol.
13.0.....	10.70	24.0.....	8.45
13.5.....	10.50	28.0.....	7.95
16.0.....	10.10	32.0.....	7.50
19.5.....	9.55	40.0.....	6.95
20.0.....	9.05	52.0.....	6.15

DISTRIBUTION OF ALDEHYDE BETWEEN PARALDEHYDE AND : (Pascal and Dupuy, 1920.)

t° in each case.	Pure water. Gms. Aldehyde per liter upper layer.	lower layer.	Aq. 5 % H_2SO_4. Gms. Aldehyde per liter upper layer.	lower layer.	Aq. 10 % H_2SO_4. Gms. Aldehyde per liter upper layer.	lower layer.
12°....	0.62	2.00	1.87	5.39	2.31	6.05
12	1.10	3.20	3.45	8.60	3.55	9.10
12	1.95	5.70			–	–
20	1.15	3.15	7.70	12.60	8.30	11.66
20	1.20	3.20	7.90	14.10	8.35	12.15
20	2.30	5.30	8.03	13.97	–	–
40	1.43	2.35	19.90	19.60	20.02	12.87
40	1.70	2.90	19.91	19.03	20.02	15.30
40	2.90	4.60	19.91	19.14	–	–

Methyl **PELLETIERINE** $C_9H_{17}NO$.

Solubility of MethylPelletierine in Water. (Tanret, 1920.)

Methylpelletierine is soluble in cold water in all proportions but when the temperature is raised the solution becomes cloudy at a definite temperature for each concentration, and at sufficiently high concentrations the alkaloid separates as droplets. The following results were obtained by adding successively increasing amounts of water to 1.0 gm. of methylpelletierine and determining the temperature of clouding.

t° of clouding.	Gms. $C_9H_{17}NO$ per 100 gms. mixture.	t° of clouding.	Gms. $C_9H_{17}NO$ per 100 gms. mixture.	t° of clouding.	Gms. $C_9H_{17}NO$ per 100 gms. mixture.
80.....	4.8	53.....	9.1	36.5.....	66.6
74.....	5.3	47.....	11.1	37.5.....	71.4
68.....	5.9	42.5.....	14.6	40.....	77.0
63.....	6.6	38.....	20.0	43.....	83.4
58.....	7.7	35.5.....	33.3	58.....	90.9
		35.5.....	50.0		

PENTANE $CH_3(CH_2)_3CH_3$.

100 cc. sat. sol. of pentane in water contain 0.06 cc. $CH_3(CH_2)_3CH_3$ at 16° (Führer, 1924.)

PETROLEUM

Solubility of Petroleum in Liquid Sulfur Dioxide.

(Zerner, Weisz and Opalski, 1922.)

Mixtures of known amounts of the two products were sealed in resistance glass tubes and the temperatures determined at which a homogeneous mixture or slight clouding occurred. The SO_2 consisted of 98.85 % SO_2, 0.56 % H_2O and 0.67 % oily residue. The petroleum was an American commercial sample which began to boil at 175°; 30.9 % distilled at 175°-200°, 47.9 % at 200°-225° and 15.6 % at 225°-250°. The $d_{18} = 0.8102$ and $n\frac{15°}{D} = 1.4514$.

t° of Demixing.	Per cent Petroleum.	t° of Demixing.	Per cent Petroleum.	t° of Demixing.	Per cent. Petroleum.
—12.6....	0.6	44.0....	22.10	13.25....	73.6
+13.0....	2.40	43.0....	29.3	- 3.0....	79.0
24.5....	4.23	38.5....	48.4	—20.5....	85.1
36.0....	8.54	34.25...	56.5	—23.5....	86.2
39.75...	11.14	28.0....	63.6		

The solutions were colored yellow to brown. At lowest concentrations of SO_2 a brown resin separates.

The above experiments are criticised by Fontein, 1923 who points out that the water present in the SO_2 affects the temperature of demixing.

The use of sulfur dioxide in the refining of petroleum is discussed in detail by Edeleanu, 1923.

PHENACETIN (*p* Acetophenetide) $C_6H_4(OC_2H_5)NHCH_3CO\,p$.

Solubility of Phenacetin in Several Solvents.

Solvent.	t°.	Gms. $C_6H_4(OC_2H_5)NHCH_3CO\,p$ per 100 gms. solvent.	Authority.
Water.....	14°	0.054	(Oliveri-Mandala, 1926.)
Aq. 9.984 % Antipyrine solution.....	14°	0.128	»
Absolute Alcohol (*com.*).....	20-25°	18.80	(Pucher and Dehn, 1926.)
Quinoline.....	»	7.83	»
Equi mol mixture Alcohol and quinoline.	»	12.87	»

Freezing-point data for mixtures of phenacetin and urethan are given by Kitran, 1924.

PHENANTHRAQUINONE $C_6H_4CO_2.CO_2C_6H_4$.

SOLUBILITY OF PHENANTHRAQUINONE IN AQUEOUS SOLUTIONS OF ACIDS AT 25°.
(Knox and Will, 1919.)

The determinations were made by shaking a weighed amount of phenanthraquinone with 200 cc. of solvent until saturation was complete, and then filtering, drying and weighing the undissolved residue of phenanthraquinone.

Solubility in Aqueous Sulfuric Acid.		Solubility in Aqueous Hydrochloric Acid.		Solubility in Aqueous Nitric Acid.	
Gm. equivalents per liter.		Gm. equivalents per liter.		Gm. equivalents per liter.	
H_2SO_4.	$C_{14}H_8O_2$.	HCl.	$C_{14}H_8O_2$.	HNO_3.	$C_{14}H_8O_2$.
0.0	0.0075	0.0	0.0075	0.0	0.0075
5.97	0.0080	3.11	0.012	4.26	0.049
6.19	0.0085	4.25	0.016	4.54	0.053
7.00	0.0095	5.12	0.023	5.02	0.067
9.48	0.012	6.05	0.029	6.15	0.099
11.6	0.019	6.07	0.031	6.66	0.114
13.7	0.030	7.20	0.046	6.70	0.118
15.1	0.043	8.50	0.058	7.20	0.157
17.1	0.082	9.25	0.088	7.45	0.175
18.6	0.116	10.8	0.157	8.30	0.227

PHENANTHRENE $C_{14}H_{10}$.

SOLUBILITY OF PHENANTHRENE IN ALCOHOL AND IN TOLUENE.
(Speyers, 1902, See Note p. 1001.)

In Alcohol.			In Toluene.		
t°.	Sp. gr. of sat. sol.	Gms. $C_{14}H_{10}$ per 100 gms. C_2H_5OH.	t°.	Sp. gr. of sat. sol.	Gms. $C_{14}H_{10}$ per 100 gms. $C_6H_5CH_3$.
0.....	0.814	3.2	0.....	0.925	26.0
10.....	0.807	3.5	10.....	0.929	30.0
20.....	0.801	4.5	20.....	0.934	45.0
25.....	0.799	5.1	25.....	0.939	55.0
30.....	0.797	5.8	30.....	0.943	70.0
40.....	0.795	7.3	40.....	0.955	140.0
50.....	0.794	9.5	50.....	0.971	172.0
60.....	0.797	14.0	60.....	0.989	280.0
70.....	0.815	30.0	70.....	1.007	480.0
			78.....	1.020	850.0

SOLUBILITY OF PHENANTHRENE IN SEVERAL ORGANIC SOLVENTS. (Henstock. 1922.)

The solutions were saturated by constant agitation and analyzed by evaporating and weighing the dried residue.

	Gms. $C_{14}H_{10}$ per 100 gms. solvent at								
Solvent.	—10°.	—5°.	0°.	+5°.	10°.	15°.	20°.	25°.	30°.
(1).....	0.0	0.60	1.20	1.80	2.40	3.00	3.60	4.20	4.80
(2).....	0.8	1.60	2.40	3.20	4.00	5.00	6.60	8.40	10.60
(3).....	1.75	2.25	2.75	3.26	3.77	4.28	4.80	5.50	5.81
(4).....	–	–	–	–	–	5.00	5.80	6.60	7.80*
(5).....	5.50	6.10	7.60	9.80	12.66	15.80	19.00	22.50	26.20
(6).....	12.20	14.80	17.44	20.64	23.84	30 64	36.78	43.22	50.42
(7).....	15.70	20.00	25.50	31.02	36.54	42.50	51.94	63.50	77.46
(8).....	21.20	22.70	25.50	29.60	34.30	39.90	46.60	54.60	64.20
(9).....	–	–	–	29.86	36.66	44.06	51.70	60.32	69.68
(10).....	21.60	28.84	37.32	45.88	54.48	63.28	72.08	80.92	89.82

(1) Methyl alcohol; (2) Light petroleum (b. pt. 60°-85°); (3) Ethyl alcohol; (4) Glacial acetic acid; (5) Carbon tetrachloride; (6) Ethyl ether; (7) Acetone; (8) Chloroform; (9) Benzene; (10) Carbon disulfide.

Additional determinations in solvent (5) carbon tetrachloride, gave results higher than the above, but it is probable that equilibrium had not been reached.

* 9.20 gms. at 35° and 11.20 gms. at 40°.

SOLUBILITY OF PHENANTHRENE IN SEVERAL ORGANIC SOLVENTS.
(Clark, 1919 *a*.)

Solvent.	*d* of solvent.	B. pt. of solvent.	Gms. $C_{14}H_{10}$ per 100 gms. solvent at 15°.5.	30°.	50°.	80°.
Benzene	0.880	80° – 80°5	16.72	40.10	–	–
Toluene	0.870	110 –110.3	13.80	29.10	–	–
Refined solvent Naphtha	0.865	145 166	12.52	22.42	30.8	84.8
Crude » »	0.893	152 –179	15.30	31.80	74.2	243.0
Heavy Naphtha	0.909	165 –185	11.94	21.30	60.3	193.0
Chloroform	1.495	60.4– 62.0	18.70	29.20	–	–
Carbon disulfide	1.270	45.7– 47.0	26.42	–	–	–
Acetone	0.800	56.0– 57.0	15.08	22.40	–	–
Light Pyridine (1)	0.952	125 –150	25.54	38.0	78.9	241.0
Heavy » (1)	1.056	202 –247	20.00	24.5	64.7	182.0
Hydrated Pyridine	1.050	94 – 96	0.43	1.32	7.4	11.1
Carbon Tetrachloride	1.610	75.5– 76.5	7.40	11.24	–	–
Gasoline	0.742	90 –164	4.53	6.30	–	–
Ethyl Ether	0.720	35 40.2	8.93	15.24	–	–

(1) These are the bases derived from coaltar oils by abstraction with sulfuric acid and liberation of the base with caustic soda. They probably contain but very little pyridine, C_5H_5N.

100 gms. methyl formate dissolve 26.1 gms. $C_{14}H_{10}$ at 25°. (Kröber, 1919.)

Freezing-point lowering data are given for :

Phenanthrene + Quinone (Kremann, Sutter, Sitte. Strzelba and Dobotzky, 1922.)
» + Retene (Pascal. 1921.)
« + Styphnic Acid (Efremov, 1919 *a*.)

PHENETOLS. See p. 1341.

PHENOL C_6H_5OH.

FREEZING-POINTS OF MIXTURES OF PHENOL AND WATER. (Rhodes and Markley, 1921.)

Carefully purified natural phenol was used. To weighed amounts in test tubes of 20 × 3.2 cm., weighed amounts of H_2O were added and the mixtures slowly cooled while being stirred. Near the estimated f. pt. the mixture was seeded by adding a small crystal of solid phenol or of phenol hydrate. "The highest temperature at which permanent crystals could be obtained was taken as the f. pt. of the mixture."

t°.	Gms. C_6H_5OH per 100 gms. mixture.	Solid Phase.
40.8 (m. pt.)	100.00	C_6H_5OH
33.0	98	C_6H_5OH + liquid phenol containing 2 C_6H_5OH .H_2O in solution.
29.3	97	
23.1	95	
16.2	92	
15.9	91.84	
15.8 (Eutec.)	91.72	$C_6H_5OH + 2\,C_6H_5OH.H_2O$
15.9	91.51	(1)
15.9 (m. pt.)	91.24	$2\,C_6H_5OH.H_2O$

(1) $2\,C_6H_5OH.H_2O$ in equilibrium with liquid hydrate containing phenol.

t°.	Gms. C_6H_5OH per 100 gms. mixture.	Solid Phase.
15.9	91	$2\,C_6H_5OH.H_2O$ in equilibrium with liquid hydrate containing water.
15.15	88	
13.3	82	
12.4 *	76	
12.2	73	
12.2 *	9	
0.85 (Eutec.)	5	$2\,C_6H_5OH.H_2O$ + Ice
0.6	3	Ice
0.45	2	»
0.35	0.5	»

* Liquid layers separate between these two points.

At concentrations of phenol between 6.5 and 91 per cent there is a metastable equilibrium having two liquid layers and solid phenol in metastable equilibrium with liquid phenol containing water.

t°.	15°.1.	6°.2.	3°.1.	2°.0.	1°.7.	1°.7.	1°.1.	0°.6.	0°.0.	-1°.2 (Eutec.)	-1°.1.
Per cent C_6H_5OH.	91	85	80	77	75	10	9	7.5	7.0	6.5	6.

Additional data on this system are also given by Bailey, 1925.

Remarks on the experiments of Rhodes and Markley (previous page).

Phenol forms a definite hydrate, $2\,C_6H_5OH.H_2O$ melting at 15°.9 and forming eutectics with anhydrous phenol and with ice, respectively. Because of the tendency towards suspended transformation, the solid phase which ordinarily appears when a mixture of water and phenol is cooled, is the metastable anhydrous phenol. Hydrated crystals were obtained only by seeding with hydrate or by cooling to very low temperatures. Hydrated crystals were originally obtained by cooling a solution of 15 per cent H_2O in phenol for 1 hour to a temperature of —78°. These were used for seeding in order to obtain points on the stable curve. This method avoided supercooling and suspended transformation.

(Approximate data for the f. pt. of mixtures of phenol and water are given by Hoffert, 1922.)

Mutual Solubility of Phenol and Water. (Hill and Malisoff, 1926.)

Highly purified materials were used. The m. pt. of the phenol was 40°.92 ± 0.01. The two bulbed solubility flasks described in *J. Am. Chem. Soc.*, 45, 1143 (1923) were used. At higher temperatures up to the consolute point 66°, the plethostatic method of Alexejeff was used.

	Phenol Phase		Water Phase	
t°.	Wt. % C_6H_5OH.	density.	Wt. % C_6H_5OH.	density.
20.....	72.16	1.0541	8.36	1.0018
25.....	71.28	1.0469	8.66	1.0045
30.....	69.90	1.0429	9.22	1.0039
35.....	67.63	1.0405	9.91	0.9974
54.83.....	59.22	–	–	–
57.30.....	–	–	14.87	–
59.20.....	55.76	–	–	–
62.55.....	51.87	–	–	–
62.74.....	–	–	19.35	–
65.24.....	44.09	–	–	–
65.79.....	–	–	27.77	–
66.01.....	–	–	29.13	–
65.79.....	–	–	30.21	–
65.90.....	–	–	31.35	
65.84.....	–	–	32.23	–
65.86.....	–	–	32.79	–
65.84.....	34.23	–	–	–

According to Bailey, 1925, the two liquid layers are in contact with solid phenol at 1°.7 and contain respectively 7.6 and 75 wt per cent C_6H_5OH. The critical solution temperature is 65.3° and the corresponding phenol content, 36.5 per cent.

A few determinations for the above system are given by Dubrisay, Tripier and Toquet, 1918, 1919.

Several determinations of the mutual solubility of phenol and water at temperatures between 66°.2 and 71°.1 and at pressures up to 1000 kilograms are given by Timmermans, 1922.

The temperature of clouding of various mixtures of phenol and aqueous solutions of sodium hydroxide, barium hydroxide, calcium hydroxide, sulfuric acid, hydrochloric acid, sodium sulfate and sodium chloride were determined by Dubrisay, 1921, 1922, and by Dubrisay, Tripier and Toquet, 1918, 1919. The presence of acids, bases and salts was shown to modify considerably the miscibility of liquid pairs. In general, various mixtures of 0.1 normal aqueous solutions were added to equal volumes of phenol (treated with just enough water to cause it to remain liquid at ordinary temperature) and the temperature of clouding determined. This method was applied to the study of reactions such as the saturation of acids by bases, formation of double sulfates and in general, physical chemical volumetry.

The miscibility of phenol and water as influenced by a third substance, such as azobenzene, anthraquinone, naphthalene, naphthylamine and salol was studied by Boutaric and Nabot, 1923. The results are given in terms of the ratio of the elevation of temperature produced by the addition of the third substance to given mixtures of phenol and water.

Equilibrium in the System Phenol, Sodium Oleate and Water at Several Temperatures. (Bailey, 1923.)

The binodal curves at several temperatures were determined by the synthetic method. Especial care to secure pure sodium oleate was observed.

Results at 0°. Gms. per 100 gms. sat. sol.		Results at 20°. Gms. per 100 gms. sat. sol.		Results at 40°. Gms. per 100 gms. sat. sol.		Results at 60°. Gms. per 100 gms. sat. sol.	
Phenol.	Na Oleate.	Phenol.	Na Oleate.	Phenol.	Na Oleate	Phenol.	Na Oleate.
7.2	0.0	7.9	0.0	9.4	0.0	17.6	0.0
8.7	0.2	9.8	0.2	12.8	0.2	28.4	0.1
12.1	0.8	10.3	0.3	16.2	0.4	36.7	0.2
16.0	1.3	13.2	0.6	24.2	0.8	53.6	–
34.8	2.9	16.5	1.0	48.4	1.8		
58.5	4.4	22.9	1.4	50.5	1.8		
64.7	3.5	41.2	2.3	57.6	1.7		
70.4	2.0	59.7	3.1	61.0	1.3		
74.7	–	62.6	2.8	64.5	0.5		
		70.8	0.4	65.6	–		
		71.4	–				

Equilibrium in the System Phenol, Pyrogallol and Water at 20°. (Bailey, 1923.)

Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
Phenol.	Pyrogallol.	Phenol.	Pyrogallol.	Phenol.	Pyrogallol.
7.9	0.0	24.5	5.8	53.1	4.8
8.5	0.8	30.1	6.0	61.0	3.3
9.2	1.6	38.7	5.9	66.9	1.7
12.5	4.1	43.2	5.7	71.4	0.0
19.2	5.3	45.2	5.5		

Equilibrium in the System Water, Phenol and : (Hœflake, 1915, 1926.)

Ortho Nitro Phenol.			Para Nitro Phenol.		
Maximum temp. of complete miscibility.	Gms. $o C_6H_4.OH.NO_2$ per 100 gms. C_6H_5OH.	Maximum temp. of complete miscibility.	Gms. $p C_6H_4.OH.NO_2$ per 100 gms. C_6H_5OH.	Maximum temp. of complete miscibility.	Gms. $p C_6H_4.OH.NO_2$ per 100 gms. C_6H_5OH.
66.45	0.0	66.4	0.0	68.3	17.38
69.35	0.87	66.55	0.12	69.95	31.74
69.6	0.95	66.8	3.65	71.65	47.4
72.15	1.70	67.2	7.71	74.5	79.6
76.8	3.04				

The method consisted in adding the amount of water to the several mixtures necessary to give the maximum temperature of complete miscibility.

Equilibrium in the System Phenol, Pyrocatechol and Water. (Leone and Angelescu, 1922.)

Synthetic mixtures of weighed amounts of the three components were made and the temperatures of clearing and of clouding of each were determined. The mixtures were prepared either by adding increasing amounts of phenol to definite concentrations of aqueous pyrocatechol or of increasing amounts of pyrocatechol to definite concentrations of aqueous phenol. For results see next page.

Equilibrium in the System Phenol, Pyrocatechol and Water (Con).

Results for Aq. 1.09 wt. % $C_6H_4(OH)_2(o)$.

t°.	Gms. C_6H_5OH per 100 gms. mixture.
27.2....	9.14
38.7....	10.44
47.0....	13.02
57.2....	18.55
59.8....	21.99
61.4....	26.80
63.2....	36.09
62.4....	47.46
60.6....	51.62
56.0....	56.84
44.4....	63.47
29.0....	68.67
17.8....	70.80

Results for Aq. 5.0 wt. % $C_6H_4(OH)_2(o)$.

t°.	Gms. C_6H_5OH per 100 gms. mixture.
15.4....	13.72
31.0....	19.25
43.6....	27.97
51.4....	40.84
52.2....	46.68
50.6....	51.67
47.4....	55.61
36.0....	62.72
31.0....	65.01
20.4....	68.06
16.2....	69.16

Results for Aq. 9.25 wt. % $C_6H_4(OH)_2(o)$.

t°.	Gms. C_6H_5OH per 100 gms. mixture.
14.0....	27.75
28.6....	35.85
34.8....	41.71
36.8....	50.13
33.6....	55.48
26.6....	60.11
18.0....	64.01
12.2....	65.98

Aq. 14.88 wt. % $C_6H_4(OH)_2(o)$.

7.0....	42.78
12.4....	49.57
10.0....	55.60
7.6....	57.69

Results for Aq. 12.5 wt. % C_6H_5OH.

t°.	Gms. $C_6H_4(OH)_2(o)$. per 100 gms. mixture.
52.0....	0.0
49.8....	0.42
44.8....	1.05
39.6....	1.65
34.4....	2.16
17.8....	3.65

Results for Aq. 35.2 wt. % C_6H_5OH.

t°.	Gms. $C_6H_4(OH)_2(o)$. per 100 gms. mixture
66.6....	0.0
61.8....	0.87
56.0....	1.92
50.8....	2.75
37.4....	4.68
30.8....	5.45
26.2	6.00
18.2....	6.84
10.4....	7.56
7.0....	7.88

Results for Aq. 60.7 wt. % C_6H_5OH.

t°.	Gms. $C_6H_4(OH)_2(o)$. per 100 gms. mixture.
53.0....	0.0
48.6....	0.79
48.6....	1.70
37.6....	2.64
33.8....	3.27
23.6....	4.67
13.8....	5.88

Isotherms for the System Phenol, Pyrocatechol and Water at 0° and at 10°.

(Leone and Angelescu, 1922.)

The determinations were made by titrations using weight pipets.

Results at 0°.

Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
C_6H_5OH.	$C_6H_4(OH)_2(o)$.	C_6H_5OH.	$C_6H_4(OH)_2(o)$.
7.23	0.0	42.29	8.97
10.53	3.82	44.77	8.96
17.20	5.94	48.68	8.74
23.05	6.95	52.71	7.96
26.47	7.55	59.85	6.23
29.32	8.01	66.00	4.07
33.98	8.55	71.46	1.69
37.42	8.81	75.42	0.00

Results at 10°.

Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
C_6H_5OH.	$C_6H_4(OH)_2(o)$.	C_6H_5OH.	$C_6H_4(OH)_2(o)$.
7.40	0.0	40.90	8.09
8.44	1.67	43.25	8.08
10.54	3.57	46.38	7.90
14.10	4.83	49.68	7.48
17.50	5.63	53.00	7.00
20.74	6.17	57.80	5.85
25.30	6.78	59.95	5.26
30.09	7.44	65.32	3.49
33.52	7.82	73.34	0.0
36.75	8.11		

Equilibrium in the System Phenol, Resorcinol and Water.

(Leone and Angelescu, 1922.)

The determinations were made as in the case of the system phenol, pyrocatechol and water (pages 1331 and 1332).

Results for Water + C_6H_5OH.

t°.	Gms. C_6H_5OH per 100 gms. mixture.
46.5...	11.15
53.5...	13.17
58.6...	15.77
62.5...	19.16
63.8...	21.36
65.2...	25.48
65.8...	26.06
66.6...	35.43
65.8...	37.42
64.4...	46.46
58.8...	54.98
54.4...	54.42

Results for Aq. 1.0 wt. % $C_6H_4(OH)_2$ (*m*) + C_6H_5OH.

t°.	Gms. C_6H_5OH per 100 gms. mixture.
38.8...	11.23
47.0...	13.53
52.2...	16.00
58.6...	22.13
60.2...	26.52
61.6...	34.87
61.8...	40.48
61.6...	44.63
59.8...	50.66
58.8...	52.49
53.0...	57.97
49.0...	60.58
42.4...	63.70
34.0...	66.51

Results for Aq. 2.91 wt. % $C_6H_4(OH)_2$ (*m*) + C_6H_5OH.

t°.	Gms. C_6H_5OH per 100 gms. mixture.
25.4...	12.17
41.0...	17.34
47.4...	22.75
51.0...	28.63
53.8...	35.40
54.6...	39.10
55.0...	41.58
55.4...	44.97
55.0...	47.16
54.6...	49.15
53.8...	50.98
51.4...	54.07
46.0...	58.70
32.6...	65.40

Results for Aq. 4.76 wt. % $C_6H_4(OH)_2$ (*m*) + C_6H_5OH.

t°.	Gms. C_6H_5OH per 100 gms. mixture.
22.0...	16.47
35.6...	23.47
41.8...	31.33
46.0...	38.95
47.6...	43.67
47.8...	45.94
47.6...	48.60
45.0...	54.05
40.2...	58.57
31.0...	63.45
19.8...	67.48

Aq. 9.09 wt. % $C_6H_4(OH)_2$ (*m*) + C_6H_5OH.

t°.	Gms. C_6H_5OH per 100 gms. mixture.
18.6...	38.20
24.0...	42.00
26.4...	45.51
27.6...	49.80
27.2...	52.58
25.7...	55.03
22.0...	57.04
16.1...	61.95

Aq. 13.04 wt. % C_6H_5OH + $C_6H_4(OH)_2$ (*m*).

t°.	Gms. $C_6H_4(OH)_2$ (*m*) per 100 gms. mixture.
54.0...	0.0
51.6...	0.29
48.8...	0.60
47.2...	0.78
43.8...	1.14
39.8...	1.56
35.7...	1.94
31.8...	2.29
24.8...	2.89
20.2...	3.26
17.4...	3.43

Aq. 35.81 % C_6H_5OH + $C_6H_4(OH)_2$ (*m*).

t°.	Gms. $C_6H_4(OH)_2$ (*m*) per 100 gms. mixture.
66.4...	0.0
65.4...	0.17
62.0...	0.66
59.2...	1.11
54.6...	1.79
49.4...	2.50
44.4...	3.13
41.8...	3.43
31.0...	4.62
24.0...	5.32
17.5...	5.88

Aq. 61.83 % C_6H_5OH + $C_6H_4(OH)_2$ (*m*).

t°.	Gms. $C_6H_4(OH)_2$ (*m*) per 100 gms. mixture.
51.1...	0.0
49.4...	0.25
37.6...	1.83
37.4...	1.98
28.4...	2.99
24.8...	3.37
21.4...	3.77
15.2...	4.38

Isotherms for the System Phenol, Resorcinol and Water.

Results at 0°.

Gms. per 100 gms. sat. sol.	
$C_6H_5(OH)$.	$C_6H_4(OH_{-2}(m)$.
7.23	0.0
8.11	1.72
9.19	2.43
10.07	3.11
13.62	4.81
19.41	5.98
24.12	6.57
27.65	6.74
32.98	7.16
36.23	7.33
40.91	7.36
45.03	7.42

Gms. per 100 gms. sat. sol.	
C_6H_5OH.	$C_6H_4(OH)_2$ (*m*).
40.03	7.45
43.12	7.50
47.88	7.29
50.67	7.03
53.98	6.73
56.72	6.12
59.12	5.60
62.67	4.68
66.78	3.37
70.50	2.01
72.57	1.22
75.42	0.0

Results at 10°.

Gms. per 100 gms. sat. sol.	
C_6H_5OH.	$C_6H_4(OH_2)$ (*m*).
7.40	0.0
8.44	1.71
9.75	2.41
10.95	3.07
13.71	4.19
15.75	4.69
23.19	5.69
28.71	6.17
31.04	6.37
32.81	6.42
38.31	6.59
45.04	6.59

Gms. per 100 gms. sat. sol.	
C_6H_5OH.	$C_6H_4(OH)_2$ (*m*).
43.30	6.59
44.39	6.58
45.23	6.49
48.54	6.24
50.66	6.19
54.15	5.62
61.37	4.09
64.33	3.26
67.86	2.09
70.64	1.14
72.36	0.30
73.34	0.0

Equilibrium in the System Phenol, Salicylic Acid and Water.

(Bailey, 1925.)

The synthetic method was employed. Varying amounts of salicylic acid were added to known mixtures of phenol and water and placed in sealed tubes. The temperature of *sudden thickening* was determined. This point was considered as a more accurate indication of the saturation temperature than the mean between the temperature of clouding and clearing. This was found especially true at the higher temperatures. No compounds or mixed crystals were found at any temperature.

The Binary and Ternary Equilibrium End Points are as Follows :

t°.	Gms. per 100 gms. of mixture. C_6H_5OH.	$C_6H_4OH.COOH(o)$.	H_2O.	Solid Phase.
−0.07..	0.0	0.103	99.9	$C_6H_4OH.COOH(o)+H_2O$ (Eutectic)
−1.2...	6.5	0.00	93.5	$C_6H_5OH+H_2O$ »
38.16..	95.0	5.0	0.0	$C_6H_4OH.COOH(o)+C_6H_5OH$ »
1.7...	7.6	0.0	92.4	C_6H_5OH+2 liquid layers
1.7...	75.0	0.0	25.0	» +2 » »
65.3...	36.5	0.0	63.5	Critical solution temperature for phenol + water
87.0...	0.0	30.0	70.0*	» » » » salicylic ac.+ »
1.3...	6.5	0.2	93.3	$C_6H_4OH.COOH(o)+C_6H_5OH+H_2O$ (Eutectic)
61.2...	20.4	7.6	72.0	Point where two binodal surfaces touch
63.4...	21.7	12.7	65.6	$C_6H_4OH.COOH(o)$+liquid layers
-0.6...	6 6	0.2	93.2	$C_6H_4OH.COOH(o)+C_6H_5OH$ + two liquid layers
−0.6...	69.6	4.2	25.9	

* Indicates unstable equilibrium.

Results for the Isotherm at 25°.

The mixtures were stirred in a thermostat and equilibrium approached from above and from below

d^{25}_{25} of sat. sol.	Gms. per 100 gms. sat. sol. C_6H_5OH.	C_6H_4OH $COOH(o)$.	Solid Phase.
1.0008	0.0	0.22	$C_6H_4OH.COOH(o)$
1.0032	2.42	0.28	»
1.0057	5.05	0.40	»
1.0080	7.51	0.53	» $+L_1+L_2$
1.0064	59.07	8.77	
1.0700	62.66	8.96	$C_6H_4OH.COOH(o)$
1.0761	83.00	6.32	»
1.0785	90.74	4.60	» $+C_6H_5OH$
1.0793	93.10	2.49	C_6H_5OH
1.0803	95.70	0.0	»

d^{25}_{25} of sat. sol.	Gms. per 100 gms. sat. sol. C_6H_5OH.	C_6H_4OH $COOH(o)$.	Solid Phase.
1.0470	70.19	0.0	L_1+L_2
1.0070	8.43	0.0	
1.050	69 28	0.51	L_1+L_2
1.0072	8.35	0.04	
1.0529	67.41	1.81	L_1+L_2
1.0074	8.23	0.13	
1.0544	65.79	3.12	L_1+L_2
1.0075	8 14	0.21	
1.0610	60.8	7.56	L_1+L_2
1.0078	7.66	0.46	

L_1 = liquid layer rich in phenol (low in salicylic acid)
L_2 = » » » » water (» » » »).

Results similar to the above are given for 30°, 44°, 58°, 61°, 63° and 68°.8.

Freezing-Points of Mixtures of Phenol and Salicylic Acid

(Bailey, 1925.)

t° of f. pt.	Gms. C_6H_5OH per 100 gms. mixture.	t° of f. pt.	Gms. C_6H_5OH per 100 gms. mixture.	t° of f. pt.	Gms. C_6H_5OH per 100 gms. mixtur
40.8.....	100.0	45.9.....	92.62	128.7.....	40.0
39.95.....	92.36	55.6.....	89.91	147.2.....	18 2
39.12.....	96.83	65.6.....	85 8	157.0.....	5 1
38.47.....	95.61	89.2.....	72.5	160.4.....	0.0
38.16(Eutec.).	95.0	113.5.....	54.0		

Equilibrium in the System Phenol, Salicylic Acid and Water

(Bailey, 1925.)

The following data for the binodal curves were obtained by the synthetic method. The author determined for each mixture the temperature of the beginning of critical opalescence (C. op.) and the critical solution temperature (C.S.T.). S = gms. $C_6H_4OH.COOH$ (*o*) per 100 gms. sat. solution.

Results for Aqueous Phenol of :

9.2 % C_6H_5OH.			14.6 % C_6H_5OH.			17.0 % C_6H_5OH.		
C.S.T.	C. op.	S.	C.S.T.	C. op.	S.	C.S.T.	C. op.	S.
32.9	32.9	0.0	56.6	56.8	0.0	59.7	60.0	0.0
58.0	58.0	5.8*	58.0	59.0	3.5	61.0	64.0	6.5
61.0	61.0	6.8*	61.0	62.0	5.9	63.0	65.0	8.8
63.0	63.0	7.7*	61.0	62.5	6.5	68.8	73.0	21.5*
68.8	69.5	11.7*	61.0	63.0	7.2*	68.0	69.0	49.5*
79.0	83.5	35.4*	63.0	65.0	9.0*	63.0	63.0	57.0*
79.0	79.5	45.5*	68.8	71.0	15.8*	58.0	58.0	58.0*
68.8	68.8	58.5*	68.8	69.0	53.4*			
58.0	58.0	65.4*	58.0	58.0	61.3*			

20.6 % C_6H_5OH.			25.0 % C_6H_5OH.			29.9 % C_6H_5OH.		
C.S.T.	C. op.	S.	C.S.T.	C. op.	S.	C.S.T.	C. op.	S.
62.0	63.2	0.0	63.4	65.8	0.0	64.6	67.0	0.0
61.0	63.5	5.2	63.0	65.0	1.3	63.0	66.0	2.2
61.0	64.0	5.6	63.0	71.5	12.6	61.0	69.0	8.3
63.0	68.0	10.8	63.0	63.0	45.6*	61.0	70.0	11.2
68.8	72.2	28.0*	58.0	58.0	49.3*	63.5	73.0	21.0
68.8	68.8	45.3*				61.0	61.0	39.2*
63.0	63.0	53.3*				58.0	58.0	42.4*
58.0	58.0	54.7*						

34.9 % C_6H_5OH.			41.7 % C_6H_5OH.			50.8 % C_6H_5OH.		
C.S.T.	C. op.	S.	C.S.T.	C. op.	S.	C.S.T.	C. op.	S.
65.3	67.3	0.0	65.0	68.3	0.0	62.2	64.4	0.0
63.0	68.0	2.3	63.0	66.0	2.3	61.0	63.0	1.6
61.0	64.5	8.1	6.01	64.0	4.8	58.0	59.0	4.1
61.0	62.0	16.0	58.0	58.0	13.3			
61.0	61.0	22.5*	*		estable points.			
58.0	58.0	32.6*						

Solubility of Phenol in Liquid Paraffin.

A series of mixtures of phenol and liquid paraffin were prepared by rubbing and warming They were then kept at 15° for 24 hours. A small amount of phenol separated from the mixture containing 2.0 per cent C_6H_5OH but none from that containing 1.0 per cent. The solubility of phenol in liquid paraffin was, therefore, considered to be between 1 and 2 per cent at 15°.

(Cofman-Nicoresti, 1922.)

Freezing-point lowering data (solubilities see foot-note, p. 1001) are given for the following mixtures.

Phenol + *m* and *p* Amidophenol (Kremann, Lupfer and Zawodsky, 1920.)
» + *o*, *m* and *p* Phenylene diamine (Kremann and Petritschek, 1917.)
» + Picric Acid (Rheinboldt, Henning and Kirscheisen, 1925.)
» + Urea » »
» + Salicylaldehyde (Kremann and Zechner, 1925.)
» + Succinic Acid (Kremann, Zechner and Dražil, 1924.)
» + Succinimide (Kremann and Dietrich, 1923.)
» + *p* Toluidine (Kitran, 1924.)

Amino PHENOLS *o*, *m* and *p* $C_6H_4.OH.NH_2$.

Solubility of Each Separately in Water and in Benzene.

(Sidgwick and Callow, 1924.)

The determinations were made by the sealed tube method. In the case of meta amino phenol it was difficult to avoid supersaturation. By proper care the two-liquid curve (L) lying some 60° below the stable solid curve (S) and even the meta stable ice curve in dilute solution, could be determined.

Results for the Solubility in Water :

Ortho Amino Phenol.		Meta Amino Phenol.			Para Amino Phenol.	
t°.	Wt. per cent $C_6H_4.OH.NH_2$ (*o*).	t° (S).	t° (L).	Wt. per cent $C_6H_4.OH.NH_2$ (*m*).	t°.	Wt. per cent $C_6H_4.OH.NH_2$ (*p*).
0.0....	1.7	20.0.....	–	2.6	0.0....	1.1
80.8....	3.02	32.6.....	–	3.69	59.....	3.01
88.0....	4.04	47.9.....	–	8.0	77.....	6.44
100.2....	7.10	53.0.....	–	10.69	86.7....	10.09
107.1....	9.98	60.4.....	—7 L*	18.13	96.6....	19.53
116.7....	17.93	— 4.2 L* (Ice)	–	18.13	102.0....	33.42
120.9....	25.08	–	—4.6 L*	20.16	103.7....	40.34
123.8....	31.96	–	—2.0 L*	25.47	106.5....	50.79
126.2....	40.03	66.4.....	+0.3 L*	30.62	110.1....	59.95
128.6....	50.17	68.9.....	+1.3 L*	40.18	116.5....	69.95
131.7....	59.73	70.2.....	+1.9 L*	46.93	128.0....	79.93
135.8....	69.61	71.5.....	+1.7 L*	52.67	145.8....	89.48
143.0....	80.46	73.2.....	+0.2 L*	59.27	186.0....	100.0
155.6....	90.48	77.2.....		68.87		
177.0....	100.0	85.2.....		80.89		
		96.0.....	–	88.84		
		122.1.....	–	100.00		
		—4.0 tr. pt.	–	21.5		
		+1.9 crit. sol. pt.	–	–		

L indicates that a second liquid phase separates.
* Indicates metastable points.

Results for the Solubility in Benzene :

Ortho Amino Phenol.		Meta Amino Phenol.		Para Amino Phenol.	
t°.	Wt. per cent $C_6H_4.OH.NH_2$ (*o*).	t°.	Wt. per cent $C_6H_4.OH.NH_2$ (*m*).	t°.	Wt. per cent $C_6H_4.OH.NH_2$ *p*.
114.9.....	3.87	96.5.....	4.87	103.....	3.16
132.2.....	9.02	105.9 (100.8 L*).	10.4	124.....	7.56
141.8.....	16.1	114.3 L.....	20.3	130.....	11.6
146.8.....	23.2	121.2 L.....	31.3	135.....	20.4
149.7.....	29.3	122.1 L.....	37.7	138.5.....	30.4
151.5.....	34.1	122.3 L (crit. t.).	40.0	143.....	40.1
153.6.....	41.3	122.1 L.....	46.1	145.....	51.0
155.7.....	49.3	121.9 L.....	50.9	149.....	60.9
158.4.....	59.7	119.3 L.....	59.0	154.....	69.2
161.5.....	69.8	111.2 L.....	68.9	186.....	100.0
165.2.....	80.4	110.8 (105.8 L*).	72.5		
168.2.....	87.6	111.4 (96.9 L*).	76.4		
177.0.....	100.0	112.6.....	82.6		
		116.4.....	91.8		
		110.6 (tr. pt.)...	16.5		
		110.6 (tr. pt.)...	69.4		

Chloro PHENOLS *o m* and *p* $C_6H_4OH.Cl$.

Solubility of Each Separately in Water and in Benzene.

(Sidgwick and Turner, 1922.)

The synthetic method was used at the higher temperatures and the Beckmann freezing-point apparatus at the lower.

Results for the Solubility in Water :

Ortho Chloro Phenol.		Meta Chloro Phenol.		Para Chloro Phenol.	
t°.	Wt.% $C_6H_4OH.Cl(o)$.	t°.	Wt.% $C_6H_4OH.Cl(m)$.	t°.	Wt.% $C_6H_4OH.Cl(p)$.
− 0.20.....	1.56(+Ice)	− 0.18.....	0 73 (+Ice)	0.2.....	2 07 (+Ice)
− 0.30.....	2.44(+Ice)	+ 1.2,.....	1.25 S	65.0.....	3.91 L
+ 82.9.....	3.76 L	2.5.....	1.85 S	113.8.....	10.66 L
106.3.....	5.12 L	85.25.....	5.12 L	125.0.....	20.5 L
159.1.....	13.58 L	118.0.....	11.13 L	128.2.....	29.16 L
165.8.....	16.45 L	123.0.....	13.56 L	129 crit. t....	− L
170.7.....	22.59 L	127.5.....	17.84 L	128.7.....	42.57 L
173 crit. t...	33.00 L	130.8crit. t...	32.02 L	125.8.....	53.49 L
172.9.....	45.04 L	130.7.....	38.89 L	122.4.....	59.62 L
170.1.....	54.95 L	130.5.....	46.12 L	115.5.....	65.05L
166.2.....	60.72 L	129.1.....	55.65 L	107.7.....	69.36 L
156.6.....	70.62 L	109.8.....	71.23 L	97.0.....	74.03 L
118.9.....	82.82 L	23.1.....	82.3 L	35.5.....	34.02 L
91.5.....	85.90 L	11.8.....	82.9 L	17.0.....	85.42 L
0.3tr. pt..	86.5 LL(+Ice)	3.2 tr.-pt..	82.3 LLS	5.5.....	86.19 L
− 2.0.....	87.73 +Ice)	− 0.4tr. pt...	83.4LL(+Ice	− 0.3.....	86.5 LLS
− 4 0.....	89.25 +Ice)	3.2(−0.9* .	84.87(+Ice)* S	0.5.....	88.92 S
− 5.0.....	89.62(+Ice)	4.5.....	87.19 S	6.2.....	92.48 S
− 8.0.....	90.87(+Ice)	4.8.....	88.66(+Ice*)	11.0.....	94.48 S
− 9.3tr. pt.	91.2 LS(+Ice)	− 8.2.....	90.11(+Ice)*,	14.2.....	95.70 S
− 8.2.....	92.2 S	− 13.2.....	91.73(+Ice)*	18.0.....	96.82 S
− 6.0.....	93.93 S	+ 10.8(−17.0*)	92.23S(+Ice*)	19.5.....	97.29 S
− 1.5.....	96.79 S	17.0.....	95.1 S	41.0.....	100.00 S
+ 2.0.....	98.39 S	22.2.....	97.1 S		
+ 7.0.....	100.00 S	32.5.....	100.0 S		

Results for the Solubility in Benzene :

5.3.....	0 0 +C_6H_6	4.0.....	4.31+C_6H_6	4.5.....	2.98 +C_6H_6)
4.6.....	3.04 »	3.2.....	7.0 »	2.4.....	10.25 »
2.7.....	8.33 »	0.5.....	15.32 »	1.0.....	15.10 »
0.0.....	15.49 »	−1.4.....	21.40 »	0.2.....	17.62 »
− 3.2.....	24.56 »	−4.5.....	31.77 »	3.2.....	29.14 »
− 5.0.....	29.01 »	−6.5.....	38.39 »	−5.0.....	35.50 »
− 11.6	45.22 »	−7.2.....	40.92 »	−5.5tr. pt...	37.5 »S
− 16.5.....	55.54 »	−7.0tr. pt..	40.0 »S	−5.4.....	38.07 S
− 18.8.....	60.68 »	−5.3(−7.5*)	41.66S(+C_6H_6*)	−3.2.....	39 67 »
− 19.5tr. pt...	61.58S »	−4.0.....	43.62 »	+2.8.....	45.65 »
− 18.5.....	62.5 S	−8.4.....	44.9(+C_6H_6*)	6.0.....	50.10 »
− 17.4.....	63 83 »	−1.5.....	47.78 S	9.1.....	55.24 »
− 16.4.....	64.90 »	0.0.....	50.68 »	12.9.....	60.53 »
− 13.7.....	69.05 »	3.4.....	57.02 »	18.0.....	68.58 »
− 7.0.....	80.32 »	7.4.....	64.65 »	20.8.....	73.13 »
− 3.8.....	84.72 »	14.2.....	75.10 »	25.8.....	80.06 »
+ 0.2.....	90.26 »	20.0.....	83.68 »	30.5.....	86.65 »
3.6.....	95.20 »	24.6.....	89.89 »	33.6.....	90.63 »
5.6.....	97.65 »	29.8.....	96.50 »	37.5.....	95.52 »

+ Ice = ice present. + C_6H_6 = Benzene present. S = Solid chlorphenol present. L = Second liquid layer present. * Indicates metastable equilibrium.

Nitro**PHENOLS** *o*, *m* and *p* $C_6H_4OH.NO_2$.

SOLUBILITY OF *m* NITROPHENOL AND OF *p* NITROPHENOL IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°. (Knox and Richards, 1919.)

Results for *m* Nitrophenol.

Equiv. Normalities.		Equiv. Normalities.	
HCl.	$C_6H_4OH.NO_2$ (*m*).	HCl.	$C_6H_4OH.NO_2$ (*m*).
0.0	0.0974	7.550	0.1009
1.925	0.0849	9.231	0.1130
3.822	0.0834	10.96	0.1284
5.720	0.0885	11.20	0.1307

Results for *p* Nitrophenol.

Equiv. Normalities.		Equiv. Normalities.	
HCl.	$C_6H_4OH.NO_2$ (*p*).	HCl.	$C_6H_4OH.NO_2$ (*p*).
0.00	0.1097	6.552	0.0990
1.650	0.0962	8.196	0.1093
3.277	0.0913	9.817	0.1230
4.993	0.0934	11.29	0.1421

SOLUBILITY OF *p* NITROPHENOL (1), *p* NITROANILINE (2), AND *m* NITROANILINE (3), EACH SEPARATELY, IN AQ. SALT SOLUTIONS AT 25°. (Kruyt and Robinson, 1926.)

Aq. 0.2 *n* solution of:	Gms. per 1000 cc. sat. sol. (1).	(2).	(3).	Aq. 0.2 *n* solution of:	Gms. per 1000 cc. sat. sol. (1).	(2).	(3).
No salt (H_2O).	11.82	0.5735	0.8929	K_2SO_4.....	11.50	0.5430	0.8349
KI.....	12.45	0.6053	0.9527	LiCl.....	10.90	0.5430	0.8449
KBr.....	11.91	0.5834	0.8857	NaCl.....	11.05	0.5480	0.8514
KCl.....	11.55	0.5606	0.8619				

SOLUBILITY OF *o*, *m* AND *p* NITROPHENOL. EACH SEPARATELY, IN SEVERAL ORGANIC SOLVENTS. (Carrick, 1921.)

Since saturation is reached very quickly with these compounds the determinations were made by adding to a carefully weighed glass stoppered flask, an accurately weighed amount of the solid and then a small amount of the solvent. The mixture was warmed slowly, while being constantly agitated, untill the solid just disappeared. The temperature was observed and the amount of solvent present determined by carefully weighing the flask. Succeeding determinations were made in exactly the same manner after adding additional amounts of the solvent.

Ortho Nitrophenol.			Meta Nitrophenol.			Para Nitrophenol.		
	Gms. $C_6H_4OH.NO_2$ (*o*) per			Gms. $C_6H_4OH.NO_2$ (*m*) per			Gms. $C_6H_4OH.NO_2$ (*p*) per	
t°.	100 gms. solvent.	100 gms. sat. sol.	t°.	100 gms. solvent.	100 gms. sat. sol.	t°.	100 gms. solvent.	100 gms. sat. sol.
RESULTS FOR THE SOLUBILITY IN ACETONE :								
+0.2...	102.44	50.60	+0.2...	169.35	62.95	0.0...	188.28	66.99
6.0...	131.42	56.79	10.1...	190.91	65.63	10.1...	204.47	67.15
11.5...	166.48	62.48	25.0...	223.43	69.08	24.6...	229.8	69.66
16.1...	211.37	67.88	34.5...	255.22	71.85	33.2...	262.74	72.43
20.1...	258.96	70.50	43.0...	301.32	75.08	41.2...	284.10	73.97
26.1...	398.97	79.97	55.2...	422.81	80.87	50.4...	327.92	76.63
30.3...	566.29	84.98	63.0...	533.20	84.21	61.7...	408.86	80.16
36.5...	1236.67	92.50	74.5...	905.20	90.05	75.2...	546.81	84.54
			84.0...	1305 88	92.88	85.6...	791.31	88.78
						97.0...	1192.50	92.30
RESULTS FOR THE SOLUBILITY IN BENZENE :								
0.0...	45.89	31.45	6.0...	0.63	0.62	8.0...	0.65	0.64
6,0...	68.11	40.51	22.0...	1.83	1.79	20.1...	0.96	0.95
14.1...	103.84	50.94	38.0...	4.99	4.75	32.1...	1.67	1.63
20.1...	148.3	59.72	48.0...	9.86	9.18	41.3...	2.83	2.75
26.9...	246.49	72.79	57.5...	20.96	17.37	65.5...	8.79	8.08
30.1...	365.41	78.51	66.0...	45.94	31.48	73.5...	15.99	13.78
34.6...	561.59	84.88	74.0...	120.43	54.63	78.5...	25.18	20.11
40.1...	873.57	89.73	81.5...	375.51	79.05	85.4...	61.71	38.09
			85.0...	571.09	84.98	91.0*.	124.54	56.05
			87.8*.	852.51	89.55	96.5*.	400.02	80.00
						104.2*.	1071.96	91.54

* Sealed tubes were used.

SOLUBILITY OF *o*, *m* AND *p* NITROPHENOL, EACH SEPARATELY, IN SEVERAL ORGANIC SOLVENTS. (CON.).

Ortho Nitrophenol.			Meta Nitrophenol.			Para Nitrophenol.		
	Gms. $C_6H_4OH.NO_2(o)$ per			Gms. $C_6H_4OH.NO_2(m)$ per			Gms. $C_6H_4OH.NO_2(p)$ per	
t°.	100 gms. solvent.	100 gms. sat. sol.	t°.	100 gms. solvent.	100 gms. sat. sol.	t°.	100 gms. solvent.	100 gms. sat. sol.
RESULTS FOR THE SOLUBILITY IN ETHYL ALCOHOL :								
0.0..	10.16	9.22	1.0..	116.91	53.87	0.0..	115.75	53.65
6.7..	13.00	11.50	11.0..	143.55	58.94	10.0..	133.84	57.23
12.4..	17.71	15.04	23.4..	183.77	64.75	18.5..	161.13	61.70
17.3..	22.08	18.09	30.5..	221.24	69.03	26.1..	193.78	65.96
23.1..	34.31	25.54	45.5..	301.54	75.20	38.6..	244.89	71.01
30.2..	60.58	41.03	50.7..	345.27	77.54	45.2..	278.91	73.61
34.3..	200.00	66.67	57.5..	422.62	80.87	52.7..	319.52	77.16
37.3..	545.48	86.68	65.5..	554.25	84.71	62.7..	415.55	80.60
41.3..	1038.44	91.22	77.2..	851.47	89.49	71.2..	545.00	84.50
			85.0..	1105.25	91.72	81.1..	800.38	88.89
						89.8..	1016.75	91.05
RESULTS FOR THE SOLUBILITY IN ETHYL ETHER.								
1.0..	37.76	27.41	+0.2..	105.92	51.44	1.0..	109.99	52.38
5.5..	44.81	30.95	8.2..	118.20	54.17	10.1..	115.56	53.61
10.5..	59.41	37.27	12.2..	127.24	55.99	18.0..	122.95	55.06
15.8..	81.07	44.75	23.5..	143.67	58.96	24.1..	131.18	56.74
21.9..	138.79	58.12	39.5..	178.74	63.89	28.7..	133.02	57.07
27.8..	249.45	71.38	48.5..	212.75	68.02	31.7..	139.23	58.20
33.2..	480.61	82.79	59.0..	269.22	72.92	38.1..	149.29	59.89
37.5..	915.45	90.23	68.0..	355.06	78.03	46.8..	167.66	62.64
			75.0..	508.89	83.58	59.9..	202.07	66.89
			83.0..	1065.84	91.42	70.5..	249.39	71.38
						87.8*.	380.29	79.23
						97.1*.	586.58	85.51
						101.9*.	1001.50	90.92

* Sealed tubes were used.

SOLUBILITY OF ORTHO NITROPHENOL IN MIXTURES OF ALCOHOL AND QUINOLINE AT 20-25°. (Pucher and Dehn, 1921.)

Per cent C_7H_9N in solvent.	Gms. $C_6H_4OHNO_2(o)$ per 100 gms. solvent (?).	Per cent C_7H_9N in solvent.	Gms. $C_6H_4OHNO_2(o)$ per 100 gms. solvent (?).	Per cent C_7H_9N in solvent.	Gms. $C_6H_4OHNO_2(o)$ per 100 gms. solvent (?).
0 (=C_2H_5OH).	404	47.5.....	1008	80.....	1296
10.0.....	504	50.0.....	1005	90.....	1367
23.2.....	720	60.0.....	1152	100.....	1450
37.5.....	864	70.0.....	1224		

Dinitro PHENOLS $C_6H_3OH(NO_2)_2$ 1.2.3; 1.2.4; 1.2.5 etc.

SOLUBILITY OF ISOMERIC DINITRO PHENOLS, EACH SEPARATELY, IN WATER.
(Sidgwick and Aldous, 1921; Sidgwick and Taylor, 1922.)

The determinations were made by the sealed tube method. The temperature of appearance of two layers, or of disappearance of the last crystal was determined. In indicating the structure of the isomers the hydroxyl group is always assumed to occupy position 1.

RESULTS FOR THE 1.2.3 COMPOUND :

t°.	Gms. $C_6H_3OH(NO_2)_2$.1.2.3 per 100 gms. sat. sol.	t°.	Gms. $C_6H_3OH(NO_2)_2$.1.2.3 per 100 gms. sat. sol.	t°.	Gms. $C_6H_3OH(NO_2)_2$.1.2.3 per 100 gms. sat. sol.
94.5.....	6.74	122.5 (crit. t.).	–	96.0.....	74.32*
108.2.....	10.90	120.4.....	52.15	112.3.....	89.85*
120.1.....	20.83	116.7.....	60.44	145.1 (m. pt.).	100.00*
122.2.....	35.13	95.0 (tr. pt.).	–		

* Solid Dinitro Phenol present.

SOLUBILITY OF ISOMERIC DINITRO PHENOLS, EACH SEPARATELY IN WATER (CON.).

RESULTS FOR THE :

1.2.4 Compound.

t°.	Gms. $C_6H_3OH(NO_2)_2$ 1.2.4 per 100 gms. sat. sol.
109.6..	1.95
126.1..	2.98
137.7..	3.81
170.5..	8.99
182.5..	12.98
200.+ crit.t.	-
187.7..	86.36
156.0..	93.35
131.2..	97.14
121.7..	97.70
117.6..	98.24
104.2 tr.pt.	-
108.1..	99.02*
112.9 m.pt.	100.0*

1.2.5 Compound.

t°.	Gms. $C_6H_3OH(NO_2)_2$ 1.2.5 per 100 gms. sat. sol.
124.7...	2.33
135.8...	2.97
146.4...	3.91
162.1...	5.69
194.5...	12.24
200.+ crit.t.	-
172.2...	91.73
146.4...	94.51
113.5...	96.72
97.5 tr. pt.	-
98.0...	97.50*
100.0...	98.48*
105 6 m.pt.	100.00*

1.2.6 Compound.

t°.	Gms. $C_6H_3OH(NO_2)_2$ 1.2.6 per 100 gms. sat. sol.
71.1...	0.703
89.6...	1.00
117.6...	1.87
139.7...	3.24
147.9...	3.97
192.5...	12.27
200.+ crit.t.	-
158.0...	93.44
138.3...	95.96
102.6...	57.80
84.5...	98.42
59.2 tr.pt.	-
59.5...	99.11*
62.2 m.pt.	100.00*

1.3.4 Compound.

t°.	Gms. $C_6H_3OH(NO_2)_2$ 1.3.4 per 100 gms. sat. sol.
82.0..	6.05
97.5..	12.74
104.6..	23.28
105.2 crit.t.	36.65
101.6..	55.40
73.8..	70.23
52.2 tr. p.	-
53.0..	74.91*
84.5..	89.43*
134.7 m.pt.	100.0*

* Solid dinitro phenol present.

RESULTS FOR THE 1.3.5 COMPOUND :

t°.	Gms. $C_6H_3OH(NO_2)_2$ 1.3.5 per 100 gms. sat. sol.	Solid Phase.
51.6....	1.36	$C_6H_3OH(NO_2)_2.2H_2O$
70.4....	3.23	two liquid layers
109.3....	10.83	» »
124.6 ...	29.98	» »
125. crit. t.	-	» »
121.5....	57.66	» »
97.6....	69.66	» » +
54.1 tr. pt.	77.6	$C_6H_3OH(NO_2)_2 + C_6H_3OH(NO_2)_2.2H_2O$

t°.	Gms. $C_6H_3OH(NO_2)_2$ 1.3.5 per 100 gms. sat. sol.	Solid Phase.
54.5....	79 57	$C_6H_3OH(NO_2)_2$
55.5....	81.70	»
57.9....	83.64	»
61.9....	86.31	»
69.9....	90.71	»
81.3....	93.00	»
100.5....	96.08	»
126.1 m. pt.	100.00	»

SOLUBILITY OF ISOMERIC DINITRO PHENOLS, EACH SEPARATELY, IN BENZENE.

(Sidgwick and Aldous, 1921; Sidgwick and Taylor, 1922).

Solid dinitro phenol was present as the solid phase in all cases.

t°.	Gms. $C_6H_3OH(NO_2)_2$ per 100 gms. sat. sol.
The 1.2.3 cmpd.	
78.7....	12.77
93.8....	25.30
102.5....	38.66
118 6....	69.05
134.9....	91.57
The 1.2.4 cmpd.	
51.0....	21.01
65.0....	34.60
77.1....	52.36
83.7....	62.77
87.2....	69.52

t°.	Gms. $C_6H_3OH(NO_2)_2$ per 100 gms. sat. sol
93.9....	79.00
99.5....	86.59
105.6....	93.61
The 1.2.5 cmpd.	
33.5....	13.96
48.5....	24.22
57.0....	33.81
67.9....	48.91
71.4....	54.78
82.4....	72.97
88.6....	82.44
98.5....	92.90

t°.	Gmgs. $C_6H_3OH(NO_2)_2$ per 100 gms. sat. sol.
The 1.2.6 cmpd.	
25.5....	43.36
34.0....	60.17
44.5....	78.52
50.0....	86.87
55.0....	92.85
The 1.3.4 cmpd.	
89.2....	6.54
106.5....	27.27
109.1....	41.65
112.1....	56.86

t°.	Gms. $C_6H_3OH(NO_2)_2$ per 100 gms. sat. sol.
113.0....	60.49
116.1....	73.10
122.6....	86.64
The 1.3.5 cmpd.	
60.9....	6.39
85.0....	20.13
94.4....	32.63
97.7....	51.13
103.4....	73.08
102.8....	83.73
116.0....	94.20

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given for each of the following mixtures :

m Amino Phenol + *o*, *m* and *p* Phenylene diamine (Kremann and Hohl, 1920.)
m » » + *o*, *m* and *p* Nitro phenols
m » » + Pyrocatechol
m » » + Pyrogallol
p and *m* Amino Phenols + Resorcinol
» » » + *p* Toluidine (Kremann, Lupfer and Zawodsky, 1920.)
Mixtures of *o*, *m* and *p* Nitrophenols (Kremann and Hohl, 1920.)
o, *m* and *p* Nitro Phenol + *o*, *m* and *p* Phenylene diamine (Carrick, 1921.)
» *p* » + Quinone (Kremann and Petritschek, 1917.)
» *p* » + Succinimide (Kremann, Sutter, Sitte, Strzelba and Dobolzsky, 1922.)
o » + Salicylaldehyde (Kremann and Dietrich, 1923.)
m and *p* » + Succinic Acid (Kremann and Zechner, 1926.)
» *p* » + *p* Toluidine (Kremann, Zechner and Dràzil, 1924.)
1.2.4-Dinitro Phenol + *o*, *m* and *p* Phenylene diamine (Kremann and Petritschek, 1917.)
» » + Quinone (Kremann and Zawodsky, 1921.)
» » + Salicylaldehyde (Kremann, Sutter, Sitte, Strzelba and Dobolzsky, 1922.)
» » + Succinic Acid (Kremann and Zechner, 1925.)
» » + Succinimide (Kremann, Zechner and Dràzil, 1924.)
(Kremann and Dietrich, 1923.)

Dinitro **PHENETOL** 1.2.4 $C_6H_3.OC_2H_5(NO_2)_2$.
Trinitro **PHENETOL** 1.2.4.6 $C_6H_2.OC_2H_5(NO_2)_3$.

SOLUBILITY OF EACH SEPARATELY IN SEVERAL SOLVENTS. (Desvergnes, 1924.)

Results for Dinitro Phenetol.

Solvent.	Gms. $C_6H_3.OC_2H_5(NO_2)_2$ 1.2.4 per 100 gms. solvent at 15°.	50°.
Water	0.0030	0.0175 (1)
Ethyl acetate	44.30	137.08
Acetone	106.96	296.59
96 % alcohol	2.07	11.08
Abs. »	2.81	9.94
Methyl alcohol	4.02	18.63
Chloroform	63.89	186.40
Anhy. ether	5.13	9.36
Pyridine	95.29	253.79
Carbon disulfide	1.10	2.32 (34°)
Carbon tetrachloride	0.74	14.40
Toluene	43.04	183.21
Benzene	63.73	209.80

Results for Trinitro Phenetol.

Solvent.	Gms. $C_6H_2OC_2H_5(NO_2)_3$ 1.2.4.6 per 100 gms. solvent at 15°.	50°.
Water	0.013	0.044 (2)
Ethyl acetate	36.53	185.17
Acetone	1.20	410.51
96 % alcohol	1.20	7.82
Abs. »	1.67	9.32
Methyl alcohol	3.99	24.00
Benzene	49.21	297.25
Chloroform	20.79	174.71
Anhy. ether	3.79	7.66 (35°.5)
Pyridine	185.35	
»	331.87	327.92 (3)
Carbon disulfide	0.43	1.69
Carbon tetrachloride	0.667	0.43
Toluene	30.80	162.98

(1) The result given for 100° is 0.1678 but at both 50° and 100° saponification occurs.
(2) The result given for 100° is 0.354 but saponification occurs.
(3) In pyridine the double compound $C_6H_2OC_2H_5(NO_2)_3.2C_5H_5N$ is formed.

PHENOL PHTHALEIN $(OHC_6H_4)_2CO.C_6H_4CO.$

SOLUBILITY OF PHENOLPHTHALEIN IN SEVERAL SOLVENTS AT 15°-20°. (?) (Utz, 1920.)

Solvent.	Gms. $C_{20}H_{14}O_4$ per 100 gms. solvent.	Solvent.	Gms. $C_{20}H_{14}O_4$ per 100 gms. solvent.	Solvent.	Gms. $C_{20}H_{14}O_4$ per 100 gms. solvent.
Water	0.0002	Chloroform	3.06	Carbon tetrachloride	trace
Ethyl alcohol	20.91	Carbon disulfide	0.18	Xylene	0.18
Methyl alcohol	14.18	Ether	5.92	Toluene	0.61
Acetone	26.39	Benzene	0.16	Nitrobenzene	4.41
				Ethyl acetate	6.57

100 gms. abs. alcohol dissolve 10.24 gms. $C_{20}H_{14}O_4$ at 20°–25°.
» quinoline » 0.32 » »
» equi. mol. mixture of alcohol and quinoline dissolve 0.19 gm. $C_{20}H_{14}O_4$ at 20°–25°. (Pucher and Dehn, 1921.)

Freezing-point lowering data are given for mixtures of phenyl dichlor acetate and phenyl chloro brom acetate by Crompton and Triffitt, 1921.

Di PHENYL CARBONATES.

Freezing-point lowering data are given for mixtures of diortho nitro diphenyl carbonate, di para nitro diphenyl carbonate and ortho para nitro diphenyl carbonate by Hœflake, 1921.

PHENYLENE DIAMINES *o*, *m* and *p* $C_6H_4(NH_2)_2$.

Solubility of Each Separately in Water. (Sidgwick and Neill, 1923.)

The determinations were made by the synthetic method.

m phenylene diamine was found to be dimorphic. The two forms are enantiotropic with a transition point at 36°. The α form (stable above 36°) consists of brown needles, the β form (stable below 36°) of mauve plates

Results for the Ortho compound.		Results for the two forms of the Meta compound.				Results for the Para compound.	
		α Form		β Form			
t°.	Gms. $C_6H_4(NH_2)_2$ (*o*) per 100 gms. sat. sol.	t°.	Gms. $C_6H_4(NH_2)_2$ (*m*) per 100 gms. sat. sol.	t°.	Gms. $C_6H_4(NH_2)_2$ (*m*) per 100 gms. sat. sol.	t°.	Gms. $C_6H_4(NH_2)_2$ (*p*) per 100 gms. sat. sol.
35.1...	4.05	0.3...	8.71	0.3...	3.27	3.6...	1.08
45.8...	5.85	4.6...	12.64	14.3...	9.22	23.7...	3.70
56.3...	11.86	9.3...	17.16	18.3...	12.64	37.8...	9.85
61.3...	18.72	11.7...	21.21	22.0...	17.16	49.9...	18.75
62.8...	23.43	16.1...	32.83	24.1...	21.21	59.2...	27.22
64.2...	31.55	18.7...	49.83	26.3...	32.83	64.6...	34.43
66.1...	46.81	20.8...	61.94	27.1...	40.62	69.9...	41.75
67.7...	62.53	22.7...	69.63	27.9...	49.83	75.5...	51.80
71.3...	74.74	26.0...	75.52	29.0...	56.51	80.3...	59.02
80.8...	88.36	32.6...	83.83	29.1...	61.94	88.5...	70.03
88.1...	93.83	43.5...	92.32	30.2...	69.63	95.9...	78.10
91.7...	96.15	53.6...	96.81	31.5...	75.52	107.0...	86.63
95.5...	97.72	57.6...	98.40	32.8...	79.15	125.1...	95.04
103.8...	100.00	62.8...	100.0	34.4...	83.83	139.7...	100.00

Solubility of *o*, *m* and *p* Phenylene Diamines in Benzene.

(Sidgwick and Neill, 1923.)

Results for the Ortho compound.		Results for the Meta compound.				Results for the Para compound.	
t°.	Gms. $C_6H_4(NH_2)_2$ (*o*) per 100 gms. sat. sol.	t°.	Gms. $C_6H_4(NH_2)_2$ (*m*) per 100 gms. sat. sol.	t°.	Gms. $C_6H_4(NH_2)_2$ (*m*) per 100 gms. sat. sol.	t°.	Gms. $C_6H_4(NH_2)_2$ (*p*) per 100 gms. sat. sol.
22.2..	1.72	19.0....	1.02	58.8...	72.14 L	59.1..	1.20
36.0..	3.13	34.1....	2.84	55.5...	74.56 L	79.9..	3.25
58.4..	9.35	46.8....	7.43	54.7...	74.84 L	98.5..	9.67
72.1..	21.06	50.7....	9.75	53.8tr.pt.	75.0 L+S.	110.6..	20.14
76.9..	31.43	59.8....	19.36 L	53.9...	75.33	112.9..	33.32
80.0..	40.95	69.0....	39.04 L	54.1...	76.84	113.9..	41.04
82.5..	49.47	69.0 crit. t.	—	54.2...	78.57	115.2..	49.10
85.6..	62.05	68.8....	50.91 L	54.7...	79.31	117.1..	59.12
91.1..	77.94	66.5....	61.60 L	56.3...	85.85	124.0..	77.86
96.8..	90.04	64.2....	65.91 L	57.2...	88.64	135.5..	94.75
100.1..	95.12	60.0....	71.04 L	62.8...	100.00	139.7..	100.00
103.8..	100.00	L indicates two liquid layers; S indicates solid phenylene diamine.					

One liter of sat. solution of *p* phenylene diamine in water contains 47.23 gms. $C_6H_4(NH_2)_2$ *p* at 25°. The corresponding figures for aq. 0.2 *n* salt solutions are: KI, 51.68; KBr, 49.68; KCl, 46.85; K_2SO_4, 43.21; LiCl, 48.32; NaCl, 47.23.
(Kruyt and Robinson, 1926.)

Freezing-point lowering data (solubilities see foot-note, p. 1001) are given for each of the following mixtures:

o, *m* and *p* Phenylene Diamine + Pyrocatechol (Kremann and Strohschneider, 1918.)
» » + Pyrogallol (Kremann and Zechner, 1918.)
» » + Resorcinol (Kremann and Strohschneider, 1918.)
» » + Salicylic acid (Kremann, Weber and Zechner, 1925.)
» » + Succinic acid » »
» » + 1.2.4 Dinitro Toluene (Kremann and Strohschneider, 1918.)
» » + 1.2.4.6 Trinitro Toluene (Kremann and Mauermann, 1923.)

Acetyl PHENYLENE DIAMINES *o*, *m* and *p* $C_6H_4NH_2.NHCOCH_3$.

Solubility of Each Separately in Water. (Sidgwick and Neill, 1923.)

The determinations were made by the synthetic method.

Results for the Ortho compound.

t°.	Gms. $C_6H_4NH_2.NHCOCH_3$ (*o*) per 100 gms. sat. sol.
7.2.....	3.40
22.0.....	12.05
33.5.....	22.32
42.1.....	31.95
50.4.....	41.64
59.1.....	51.73
69.9.....	64.10
78.2.....	71.72
88.1.....	79.22
99.0.....	85.80
115.4.....	92.23
144.8.....	100.0

Results for the Meta compound.

t°.	Gms. $C_6H_4NH_2.NHCOCH_3$ (*m*) per 100 gms. sat. sol.
48.7.....	9.05
82.9.....	18.12
110.1.....	28.20
132.9.....	44.13
144.2.....	53.34
156.3.....	63.56
167.0.....	71.10
181.9.....	79.34
204.4.....	86.73
235.8.....	94.15
279.0.....	100.0

Results for the Para compound.

t°.	Gms. $C_6H_4NH_2.NHCOCH_3$ (*p*) per 100 gms. sat. sol.
56.8.....	6.50
86.3.....	18.63
92.1.....	27.63
93.7.....	34.27
96.5.....	42.82
98.6.....	49.10
103.2.....	60.15
107.1.....	69.35
112.6.....	76.50
119.2.....	81.74
144.0.....	94.13
160.5.....	100.00

Solubility of *o*, *m* and *p* Monoacetyl Phenylene Diamines in Benzene. (Sidgwick and Neill, 1923.)

Ortho compound.

t°.	Gms. $C_6H_4NH_2.NHCOCH_3$ *o* per 100 gms. sat. sol.
29.9.....	4.13
53.6.....	11.21
73.5.....	20.24
84.2.....	27.36
92.4.....	35.27
99.8.....	43.04
106.7.....	51.50
117.8.....	65.12
127.5.....	77.76
135.2.....	88.05
144.8.....	100.00

Meta compound.

t°.	Gms. $C_6H_4NH_2.NHCOCH_3$ (*m*) per 100 gms. sat. sol.
56.5.....	3.13
107.1.....	6.72
163.2.....	12.24
228.5.....	22.75 L
263.4.....	39.10 L
265.5.....	44.31 L
266 crit. t....	–
265.1.....	49.23 L
257.6.....	57.03 L
227.8.....	68.90 L
201.9.....	74.65 L
193.4.....	76.17 L
188.4.....	76.86 L
184.9 tr. pt..	77.5 L+S
185.4.....	77.55
187.1.....	78.61
190.0.....	80.12
203.1.....	85.50
221.9.....	91.06
279.0.....	100.00

Para compound.

t°.	Gms. $C_6H_4NH_2.NHCOCH_3$ (*p*) per 100 gms. sat. sol.
116.2.....	7.15
180.8.....	17.36 L
187.8.....	30.12 L
188 crit. t....	–
186.3.....	41.23 L
181.3.....	51.70 L
170.0.....	59.95 L
163.5.....	63.07 L
155.9.....	67.66 L
150.1.....	71.05 L
147.1.....	72.71 L
146.8.....	73.90 L
146.8 tr. pt..	74.0 L+S
147.3.....	74.62
148.2.....	76.85
148.7.....	78.41
149.8.....	80.70
152.0.....	86.19
156.8.....	93.82
160.5.....	100.00

L, indicates two liquid layers.
S, indicates solid phenylene diamine.

PHENYL HYDRAZINE HELIANTHATE $C_5H_8N_2.C_{14}H_{15}N_3SO_2$.

1000 cc. H_2O dissolve 0.135 gm. phenyl hydrazine helianthate at 20-25°.
(Stark and Dehn, 1918.)

Phenyl Glyoxal**PHENYL HYDRAZONE**, α and β forms, $C_6H_5.CO.CH:N.NHC_6H_5$.

SOLUBILITY OF PHENYL GLYOXAL HYDRAZONE IN SEVERAL SOLVENTS.
(Sidgwick and Ewbank, 1921.)

The determinations were made by the synthetic method. In the case of alcohol as the solvent, the α form of the compound is transformed into the β form before saturation is reached. Hence results could be obtained only for the β form in alcohol. M. pt. of α form = 114-117°; of β form = about 145-146°.

RESULTS OF THE SOLUBILITY DETERMINATIONS IN :

Ethyl Alcohol.

t°.	Gms. β form of the cmpd. per 100 gms. sat. sol.
70.....	8.8
83.4....	19.6
93.5....	39.5
98.0....	55.2
103.4....	74.9
113.5....	90.2
128.5....	100.0

Benzene.

t°.	Gms. β form of the cmpd. per 100 gms. sat. sol.
3.0....	0.322
26.....	4.8
44.2....	10.4
59.1....	19.9
67.2....	30.2
74.3....	38.6
79.5....	45.0
98.0....	70.8
115.1....	89.8

t°.	Gms. α form of the cmpd. per 100 gms. sat. sol.
3.0....	5.84
8.0....	10.4
29.0....	19.9
40.8....	30.2
50.0....	38.6
56.0....	45.0
75.3....	89.8

IN NORMAL HEPTANE :

t°.	Gms. compd. per 100 gms. sat. sol.	Solid Phase.
71.72....	1.82	β form
80.81....	4.63	»
93.5.....	10.1	»
103.2.....	17.0	»
111.0.....	35.4	»
113.0.....	55.9	»

t°.	Gms. cmpd. per 100 gms. sat. sol.	Solid Phase.
58.2.....	4.63	α form
75.8.....	10.1	»
84.7.....	17.0	»
94.0.....	35.4	»
96.0.....	55.9	»

SOLUBILITY OF THE TWO FORMS, EACH DETERMINED SEPARATELY IN SEVERAL SOLVENTS AT 32°.

Solvent.	Gms. per 100 gms. sat. sol. α form.	Gms. per 100 gms. sat. sol. β form.	Ratio.
Benzene.....	25.1	8.0	3.1 to 1.0
Heptane.....	1.7	0.55	3.1 to 1.0
Carbon tetrachloride.....	8.8	2.27	3.9 to 1.0
Cyclo Hexane.....	2.56	1.56	1.7 to 1.0

PHENYL PHOSPHATE. Thiophosphate, Phosphine Oxide, etc.

Freezing-point lowering data are given by Pascal, 1923, for the following mixtures.

Phenyl phosphate $PO(OC_6H_5)_3$ + Phenyl thiophosphate $PS(OC_6H_5)_3$.
» » + Triphenyl phosphine oxide $PO(C_6H_5)_3$.
Phenylthiophosphate $PS(OC_6H_5)_3$ + » sulfide $PS(C_6H_5)_3$.
Triethylphosphine sulfide $PS(C_2H_5)_3$ + » » »
Phenylphosphate $PO(OC_6H_5)_3$ + Phenylmethylphosphate $CH_3PO(OC_6H_5)_3$.
Triphenylphosphine oxide $PO(C_6H_5)_3$ + Triphenyl phosphine sulfide $PS(C_6H_5)_3$.

PHENYL TARTRIMIDE and Related Compounds.

Solubility of Each Separately in Water and in Methyl Alcohol.
(Casale, 1917, 1918.)

Compound.	Formula.	Solvent.	t°.	Gms. cmpd. per 100 gms. sat. sol.
d Phenyl tartrimide or Tartranil	$CHOH.CO\diagdown\diagup NC_6H_5$ / $CHOH.CO$	H_2O	Changes to tartranilic acid	
		CH_3OH	18	2.84
d Phenyl tartraminic acid or Tartranilic acid	$CHOH.CONH.C_6H_5$ / $CHOH.COOH$	H_2O	17.4	2.853
		CH_3OH	14	15.66
d Mono phenyl tartramide or tartranilamide	$CHOH.CONH.C_6H_5$ / $CHOH.COONH_2$	H_2O	21.5	0.4726
		CH_3OH	21.5	1.031
d Tartranilide	$CHOH.CONH.C_6H_5$ / $CHOH.CONH.C_6H_5$	CH_3OH	20	0.2151
p Ethoxy phenyl tartramide	$CHOH.CO\diagdown\diagup NC_6H_4.OC_2H_5$ / $CHOH.CO$	CH_3OH	14	1.504
p Ethoxy phenyl tartraminic acid	$CHOH.CONH.C_6H_4.OC_2H_5$ / $CHOH.COOH$	H_2O	14	0.4005
Methyl ether of *p* Ethoxy phenyl tartraminic acid	$CHOH.CONH.C_6H_4.OC_2H_5$ / $CHOH.COO.CH_3$	CH_3OH	15	1.88
Ethyl ether of *p* Ethoxy phenyl tartraminic acid	$CHOH.CONH.C_6H_4.OC_2H_5$ / $CHOH.COO.C_2H_5$	CH_3OH	15	4.496
p Oxy phenyl tartramide	$CHOH.CO\diagdown\diagup N.C_6H_4OH$ / $CHOH.CO$	CH_3OH	13	2.913
d Mono oxy phenyl tartramide	$CHOH.CO.NH.C_6H_4OH$ / $CHOH.CO.NH_2$	CH_3OH	15	1.58
d Mono oxy di phenyl tartramide	$CHOH.CO.NH.C_6H_4OH$ / $CHOH.CO.NH.C_6H_5$	CH_3OH	15	1.582
p Oxy phenyl tartraminic acid	$CHOH.CO.NH.C_6H_4OH$ / $CHOH.COOH$	H_2O	14	4.215

PHLOROGLUCINOL 1.3.5 $C_6H_3(OH)_3.2H_2O$.

100 gms. Cymene dissolve 0.12 gm. $C_6H_3(OH)_3$ at 175°. (Wheeler, 1920.)

PHOSGENE (Carbonyl Chloride) $COCl_2$.

Solubility of Phosgene in Several Solvents at 20.21°. (Baskerville and Cohen, 1921.)

The $COCl_2$ gas was passed at atmospheric pressure thoungh a Bowen's absorption bulb containing the solvent and the increase in weight determined.

Solvent.	Gms. $COCl_2$ dissolved per 100 gms. solvent.	Solvent.	Gms. $COCl_2$ dissolved per 100 gms. solvent.
Carbon tetrachloride	27.67	Benzene	99.31
Chloroform	58.70*	Toluene	66.59*
Gasoline	81.08*	Glacial acetic acid	62.10*
Paraffine oil	0.0	Ethyl acetate	98.54
Russian mineral oil	35.88	Chlorocosane	30.95

* In these cases positive evidence was obtained that chemical reaction occurred.

PHOSPHORIC ACID (ortho) H_3PO_4.

Freezing-points of Aqueous Solutions of Phosphoric Acid. (Ross and Jones, 1925.)

t°.	Gms. H_3PO_4 per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. H_3PO_4 per 100 gms. sat. sol.	Solid Phase.
— 5	17.5	Ice	—35	47.5	Ice
—10	27.0	»	—45	51.0	»
—15	34.0	»	—60	55.0	»
—20	38.0	»	—75	59.5	»
—25	42.0	»	—85 (eutec.)	62.5	» $+2H_3PO_4.H_2O$

SOLUBILITY OF ORTHO PHOSPHORIC ACID IN WATER. (Ross and Jones, 1925.)

The mixtures were stirred at constant temperature for at least three days. The analysis was made by titrating with standard Na OH solution, using phenolphthalein as indicator.

t°.	Gms. H_3PO_4 per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. H_3PO_4 per 100 gms. sat. sol.	Solid Phase.
—85 (Eutec.)..	62.5	Ice + $2H_3PO_4.H_2O$	28.28.....	92.72	$2H_3PO_4.H_2O$
—57.....	67.0	$2H_3PO_4.H_2O$	27.36.....	93.33	»
—43.....	70.0	»	26.08.....	93.74	»
—29.0.....	72.5	»	23.50 (Eutec.).	94.75	» + H_3PO_4
—17.5.....	75.0	»	25.88.....	95.22	H_3PO_4
0.0.....	78.75	»	27.30.....	95.56	»
18.92.....	84.07	»	28.38.....	95.86	»
23.41.....	85.93	»	29.90.....	96.18	»
25.24.....	87.05	»	31.96.....	96.80	»
27.30.....	88.51	»	34.06.....	97.40	»
28.75.....	90.00	»	36.15	98.00	»
29.32 m. pt..	91.60	»	40.02.....	99.27	»
28.80.....	92.30	»	42.35 m. pt...	100.00	»

The authors failed to find the decihydrate reported by Smith and Menzies, 1909

PHOSPHORUS (White) P_4.

SOLUBILITY OF WHITE PHOSPHORUS IN SEVERAL SOLVENTS.
(Hildebrand and Buehrer, 1920.)

RESULTS FOR SOLUBILITY IN :

Carbon Disulfide.		*p* Dibrom Benzene.		Ethylene Bromide.		Naphthalene.		Phenanthrene	
t°.	Mol. % P_4.	t°.	Mol. % P_4.	t°.	Mol. % P_4.	t°.	Mol. % P_4.	t°.	Mol. % P_4.
—7.8..	6	154.3..	41	169.6..	41	132.8..	26	199.2..	55
—6.7..	34	159.4..	49	165.0..	44	201.4..	49	199.5..	57
—5.9..	43	162.0..	54	163.0..	47	195.5..	56	199.1..	73
—6.4..	50	163.0..	61	165.5..	56	202.7..	60	198.0..	80
—6.4..	59	159.0..	70	162.2..	63	201.6..	74	200 crit. t.	
—6.6..	74	163 crit. t.		151.7..	81	200.2..	75		
—6.5 crit. t.				165 crit. t.		190.4..	80		
						202 crit. t.			

The critical temperatures of solution given above were obtained by plotting the preceding results and reading from the curve. Single determinations in decane and chlorobenzene gave as critical temperatures, $> 390°$ and $264°$ respectively.

Ortho **PHTHALDEHYDE** $C_6H_4(CHO)_2$.

SOLUBILITY IN WATER BY DETERMINED THE FREEZING-POINT METHOD.
(Seekles, 1923.)

1st. f. pt.	2nd. f. pt.	Mol. % $C_6H_4(CHO)_2$.	1st. f. pt.	2nd. f. pt.	Mol. % $C_6H_4(CHO)_2$.
53.2	—	100	45.4	—	0.693*
46.9	45.1	63.97	35.0		0.68*
45.6		57.05	25.0		0.662*
45.4	45.0	54.10	15.0	(60)	0.637*
45.2		52.81		—0.61	0.64
45.0		51.45	—0.55		0.552
45.3	(±57)	50.00	—0.44		0.463
45.2	45.0	48.45	—0.38		0.374
45.4	45.0	47.03	—0.30		0.285
45.4	(45.4)	45.68	—0.09	—	0.089
45.4	(45.4)	38.73	—0.05		0.036
45.4	(45.4)	33.33	0.0		0.0 (= H_2O)

The figures in parentheses show the temperatures of separation.

* These determinations were made by direct measurement of the solubility of the compound in water the results show the formation of the monohydrate $C_6H_4(CHO)_2.H_2O$.

PHTHALIC ACID $C_6H_4(COOH)_2(o)$.

Solubility of Phthalic Acid in Water and in Aqueous Sodium Sulfate Solutions. (Mc Master, Bender and Weil, 1921.)

Saturation was secured by constant stirring and by approaching equilibrium from above and from below.

	Gms. $C_6H_4(COOH)_2(o)$ per 100 gms. saturated solution in		
t°.	Water.	Aq. 10 % Na_2SO_4.	Aq. 15 % Na_2SO_4.
25	0.7014	0.6440	0.5272
35	1.0125	0.9338	0.7575
45	1.446	1.341	1.080
55	2.168	1.858	1.639
65	3.246	3.018	2.445
75	4.926	4.373	3.748
85	7.687	6.461	5.533

Solubility of Phthalic Acid in Aqueous Solutions of Hydrochloric Acid and of Nitric Acid at 25°. (Knox and Richards, 1919.)

In Aq. Hydrochloric Acid.				In Aq. Nitric Acid.			
Equiv. Normalities.		Equiv. Normalities.		Equiv. Normalities.		Equiv. Normalities.	
HCl	$C_6H_4(COOH)_2$.	HCl	$C_6H_4(COOH)_2$.	HNO_3	$C_6H_4(COOH)_2$.	HNO_3	$C_6H_4(COOH)_2$.
0.00	0.0852	7.603	0.0135	0.00	0.0852	10.40	0.0325
1.729	0.0422	9.150	0.0120	2.077	0.0582	12.60	0.0350
3.113	0.0298	10.63	0.0128	4.077	0.0470	14.42	0.0420
4.693	0.0216	12.05	0.0137	6.718	0.0375	15.99	0.0577
6.100	0.0172			9.027	0.0331		

Distribution of Phthalic Acid at 25° Between: (Smith, 1921, 1922.)

Water and Ether.			Water and Xylene.			Acetone and Glycerol		
Millimols. $C_6H_4(COOH)_2(o)$ per liter of.			Millimols. $C_6H_4(COOH)_2(o)$ per liter of.			Millimols. $C_6H_4(COOH)_2(o)$ per liter of.		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.	Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
0.9687	0.6687	0.690	14.45	0.35	0.0243	0.9375	0.8750	1.07
1.5375	1.100	0.716	32.55	1.25	0.0384	1.775	1.5875	1.12
2.375	1.925	0.810	38.60	1.70	0.0430	3.800	3.200	1.19
3.800	3.375	0.880				8.025	6.375	1.26
6.675	6.575	0.985						

Distribution of *n* Methyl Piperidine Acid Phthalate and of Piperidine Acid Phthalate Between Acetone and Glycerol at 25°. (Smith, 1921, 1922.)

See note under trimethyl amine acid phthalate on p. 1301.

Results for Methyl Piperidine Acid Phthalate.			Results for Piperidine Acid Phthalate.		
Millimols. Phthalate per liter of.		$\frac{A}{G}$.	Millimols. Phthalate per liter.		$\frac{A}{G}$.
Acetone layer (A).	Glycerol layer G.		Acetone layer (A).	Glycerol layer G.	
0.480	1.280	0.375	0.250	0.356	0.702
0.680	2.460	0.276	0.369	0.79	0.467
0.90	4.55	0.198	0.482	1.85	0.261
1.76	12.75	0.138	0.700	3.86	0.181
			1.475	10.31	0.143

100 gms. cymene (b. pt. 176°-176°.5) dissolve 0.024 gm. $C_6H_4(CO\,OH)_2(o)$ at 25°. (Wheeler, 1920.)

Freezing-point data for mixtures of phthalic acid and phthalic anhydride are given by Monroe, 1919. Results for binary and ternary mixtures composed of phthalic anhydride, butyl phthalate (active and racemic) and secondary butyl alcohol are given by Lombaers, 1924.

PHTHALONIC ACID $HOOC.C_6H_4.COOH$ (*o*):

100 gms. H_2O dissolve 115.0 gms. Phthalonic acid at 15° (Sidgwick and Clayton, 1922.)
» $CHCl_3$ » 2.0 » » » »

PHTHALYL CHLORIDE $C_6H_4(COCl)_2$.

Freezing-point data for mixtures of symetrical (m. pt. 15°-16°) and asymetrica (m. pt. 88°-89°) phthalyl chloride are given by Csanyi, 1919.

α PICOLINE HELIANTHATE.

1000 cc. H_2O dissolve 65.3 gms. α Picoline Helianthate at 20-25°.
(Stark and Dehn, 1918.)

PICRIC ACID $OH.C_6H_2(NO_2)_3$, 1.2.4.6.

SOLUBILITY OF PICRIC ACID IN AQUEOUS SOLUTIONS OF SEVERAL SALTS AT 25°. (Schreiner, 1924.)

Saturation was secured by constant rotation.

Results for aqueous solutions of:

Barium chloride.		Magnesium sulfate.		Magnesium sulfate.		Sodium chloride.	
Gm. mols. per liter		Gm. mols. per liter		Gm. mols. per liter		Gm. mols. per liter	
$BaCl_2$.	$OH.C_6H_2(NO_2)_3$.	$MgSO_4$.	$OH.C_6H_2(NO_2)_3$.	$MgSO_4$.	$OH.C_6H_2(NO_2)_3$.	NaCl.	$OH.C_6H_2(NO_2)_3$.
0.00	0.0575	0.00	0.0575	0.13	0.0830	0.01	0.0584
0.01	0.0599	0.01	0.0626	0.15	0.0859	0.03	0.0602
0.03	0.0618	0.03	0.0680	0.17	0.0888	0.05	0.0614
0.05	0.0683	0.05	0.0720	0.20	0.0916	0.07	0.0624
0.07	0.0691	0.07	0.0752	0.35	0.1052	0.10	0.0633
0.10	0.0720	0.10	0.0796	0.50	0.1159	0.30	0.0659

SOLUBILITY OF PICRIC ACID IN AQUEOUS SOLUTIONS OF NITRIC ACID AT 25°.
(Knox and Richards, 1919.)

Equiv. Normalities		Equiv. Normalities		Equiv. Normalities	
HNO_3.	$OH.C_6H_2(NO_2)_3$.	HNO_3.	$OH.C_6H_2(NO_2)_3$.	HNO_3.	$OH.C_6H_2(NO_2)_3$.
0.00	0.0378	4.161	0.0237	10.47	0.1006
1.022	0.0108	6.289	0.0405	12.47	0.1763
2.059	0.0124	8.334	0.0612	14.29	0.3533

DISTRIBUTION OF PICRIC ACID BETWEEN AQUEOUS SOLUTIONS OF SALTS AND BENZENE AT 25°. (Schreiner, 1924.)

Results for $Aq.BaCl_2 + C_6H_6$.

Gm. equiv. $BaCl_2$ per liter.	Mols. $OH.C_6H_2(NO_2)_3$ per liter	
	aq. layer.	C_6H_6 layer.
0.015	0.0187	0.0534
0.025	0.0170	0.0419
0.035	0.0179	0.0442
0.050	0.0165	0.0358

Results for $Aq.NaCl + C_6H_6$.

Gm. equiv. NaCl per liter	Mols. $OH.C_6H_2(NO_2)_3$ per liter	
	aq. layer.	C_6H_6 layer.
0.015	0.0250	0.0924
0.025	0.0254	0.0924
0.050	0.0240	0.0784
0.100	0.0228	0.0674

Results for $Aq.MgSO_4 + C_6H_6$.

Gm. equiv. $MgSO_4$ per liter.	Mols. $OH.C_6H_2(NO_2)_3$ per liter	
	aq. layer.	C_6H_6 layer.
0.015	0.0250	0.0796
0.025	0.0260	0.0772
0.035	0.0249	0.0662
0.050	0.0235	0.0517

Gm. equiv. $MgSO_4$ per liter.	Mols. $OH.C_6H_2(NO_2)_3$ per liter	
	aq. layer.	C_6H_6 layer.
0.065	0.0237	0.0503
0.100	0.0252	0.0471
0.200	0.0253	0.0360

DISTRIBUTION OF PICRIC ACID BETWEEN WATER AND TOLUENE AT 19°.
(Schilow and Lepin, 1922.)

Gms. $OH.C_6H_2(NO_2)_3$ per 100 cc. of	
aq. layer.	toluene layer.
0.236	0.534
0.352	1.132
0.650	3.215
0.980	6.810
1.220	10.500*

* Excess picric acid present.

Solubility of Picric Acid in Several Solvents.

Solvent.	t°.	Gms. $OH.C_6H_2(NO_2)_3$ per 100 gms. solvent.	Authority.
Carbon tetrachloride	20	0.07	(Pawlewski, 1914, 1926.)
Chloroform	20	1.86	»
Para Cymene (b. pt. 176°-176°5	25	2.611	(Wheeler, 1920.)
Glycol Diacetate (b. pt. 188°-189°6)	25	46.3	(Taylor and Rinkenbach, 1926.)

Solubility of Picric Acid in Mixtures of Solvents at 12°.

(Angelescu and Dumitrescu, 1923.)

The mixtures of solvents were saturated with picric acid at 25°-30° and then the excess of picric acid was allowed to crystallize out while the solutions were kept in a thermostat at 12°. Thus constant agitation was not employed. The solutions were analyzed by evaporating the solvent at room temperature, dissolving the residue of picric acid and titrating it with 0.1 *n* KOH, using phenolphthalein as indicator.

Results for the Solubility of Picric Acid in Mixtures of :

Carbon Tetrachloride and Ethyl Alcohol. Gms. per 100 gms. sat. sol.			Chloroform and Ethyl Alcohol. Gms. per 100 gms. sat. sol.			Benzene and Ethyl Alcohol. Gms. per 100 gms. sat. sol.		
CCl_4.	C_2H_5OH.	$OHC_6H_2(NO_2)_3$.	$CHCl_3$.	C_2H_5OH.	$OHC_6H_2(NO_2)_3$.	C_6H_6.	C_2H_5OH.	$OHC_6H_2(NO_2)_3$.
99.91	0.0	0.09	98.01	0.0	1.99	93.51	0.0	6.49
89.81	9.02	1.17	86.48	9.51	4.01	72.64	13.98	13.38
83.77	14.14	2.09	80.57	14.60	4.83	65.01	19.88	15.11
77.67	19.65	2.68	74.65	20.10	5.25	59.21	25.01	15.78
69.73	26.95	3.32	69.18	25.11	5.71	51.18	32.54	16.28
64.07	32.20	3.73	60.54	33.40	6.06	57.81	46.81	15.38
55.99	39.89	4.12	52.82	41.08	6.10	23.37	62.97	13.66
37.59	56.87	5.54	44.96	48.88	6.16	16.14	71.84	12.02
15.13	77.27	7.60	41.99	51.52	6.49	8.78	81.27	9.95
0.0	90.56	9.44	25.30	68.33	6.37	0.0	90.56	9.44
			13.94	79.11	6.95			

Solubility of Picric Acid in Mixtures of Benzene and Hexane.

(Tausz and Schnabel, 1919.)

The temperature is not stated. The picric acid was determined by titration with 0.1 *n* Na OH using phenolphthalein as indicator.

Solvent cc. C_6H_6	+ cc. C_6H_{14}.	Cc. 0.1 *n* Na OH per 100 cc. sat. sol.	Gms $OH.C_6H_2(NO_2)_3$ per 100 cc. sat. sol.
75	25	152	3.474
50	50	49	1.123
25	75	10	0.229
0	100	0	0.0

Freezing-point data are given for mixtures of picric acid and each of the following compounds :

Picramide (Efremov, 1918.)
Picryl Chloride »
p Quinone (Kremann, Sutter, Sitte, Strzelba and Dobolzsky, 1922.)
Retene (Efremov, 1918.)
Salicylaldehyde (Kremann and Zechner, 1925.)
Succinimide (Kremann and Dietrich, 1923.)
Succinic Acid (Kremann, Zechner and Drazil, 1924.)
Stilbene (Efremov, 1918.)
Tetryl (Taylor and Rinkenbach, 1923 *a*.)
2.4 Dinitro Toluene (Wogrinz and Vari, 1919.)
Trinitro Toluene (Taylor and Rinkenbach, 1923 *a*.)

Freezing-point data are also given for the following mixtures :

Picramide + Phenanthrene (Efremov, 1918.)
» + Retene »
Picryl Chloride + Phenanthrene »
» » + Retene »
Picryl Sulfide + Tolite (Roche and Thomas, 1923.)

PINACOL (Pinacone) $C_6H_{12}(OH)_2.6H_2O$ and H_2O.

SOLUBILITY IN WATER DETERMINED BY THE FREEZING-POINT METHOD.
(Pushin and Glagoleva, 1922.)

t°.	Mol. % $C_6H_{12}(OH)_2$.	Solid Phase.	t°.	Mol. % $C_6H_{12}(OH)_2$.	Solid Phase.	t°.	Mol. % $C_6H_{12}(OH)_2$.	Solid Phase.
− 0.45 eutec.	−	Ice+1.6	45.3.....	17.0	1.6	41.2.....	53.3	1.1
+16.7.....	0.50	1.6	45.2.....	19.5	»	41.0.....	57.5	»
22.0.....	0.86	»	45.1.....	21.9	»	39.5.....	64.8	»
28.0.....	1.3	»	44.8.....	24.4	»	36.6.....	70.8	»
34.7.....	2.2	»	43.3.....	31.1	»	33.7.....	76.4	»
37.4.....	2.7	»	41.8.....	34.3	»	29.4 eutec.	80.4	»+$C_6H_{12}(OH)_2$
40.2.....	3.6	»	40.4 eutec.	36.5	»+1.1	30.2.....	82.8	$C_6H_{12}(OH)_2$
43.7.....	6.5	»	40.7.....	37.8	1.1	33.2.....	87.0	»
44.9.....	9.6	»	40.6.....	39.6	»	38.6.....	93.4	»
45.3.....	12.7	»	41.2.....	45.0	»	39.7.....	97.0	»
45.4 m. pt..	14.3	»	41.25 m.pt.	50.0	»	41.1 m. pt.	100.0	»

$1.6 = C_6H_{12}(OH)_2.6H_2O$; $1.1 = C_6H_{12}(OH)_2.H_2O$.

PIPERIDINE (Hexahydro Pyridine) $CH_2\langle\begin{matrix}CH_2.CH_2\\CH_2.CH_2\end{matrix}\rangle NH$.

DISTRIBUTION OF PIPERIDINE AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Chloroform.

Millimols. $C_5H_{11}N$ per liter		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.400	0.800	2.00
0.643	1.556	2.42
1.200	3.625	3.02
1.725	6.225	3.61

Water and Ether.

Millimols. $C_5H_{11}N$ per liter		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
1.10	1.675	0.657
2.60	3.80	0.685
4.85	6.70	0.724
8.60	11.30	0.760
14.10	17.85	0.790

Water and Xylene.

Millimols. $C_5H_{11}N$ per liter		
H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.
1.25	0.45	0.360
1.85	0.75	0.406
2.85	1.30	0.456
3.725	1.975	0.53
7.00	4.00	0.57

Acetone and Glycerol.

Millimols. $C_5H_{11}N$ per liter		
Acetone layer (A).	Glycero layer (G).	$\frac{A}{G}$.
0.225	1.3125	0.144
0.725	2.85	0.254
0.85	3.25	0.262
1.875	5.45	0.344
2.375	6.775	0.350

Millimols. $C_5H_{11}N$ per liter		
Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
4.0	9.95	0.402
4.925	12.00	0.41
7.8	17.35	0.45
10.6	23.4	0.453
16.0	33.3	0.48

n Methyl PIPERIDINE $C_5H_{10}N.CH_3$.

DISTRIBUTION OF *n* METHYL PIPERIDINE AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Ether.

Millimols. $C_5H_{10}N.CH_3$ per liter of		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.805	1.37	1.70
1.33	2.31	1.74
2.065	3.59	1.74
3.42	6.20	1.81
5.92	10.92	1.85

Water and Xylene.

Millimols. $C_5H_{10}N.CH_3$ per liter of		
H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.
0.683	0.934	1.365
1.05	1.325	1.260
1.70	2.300	1.350
1.85	2.575	1.390
2.40	3.40	1.420
3.70	6.21	1.640
7.33	12.67	1.725

Acetone and Glycerol.

Millimols. $C_5H_{10}N.CH_3$ per liter of		
Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
0.29	1.03	0.282
0.65	1.30	0.500
1.375	2.00	0.687
3.10	3.50	0.886
6.10	6.60	0.954
11.15	11.05	1.010
22.2	20.8	1.068

PIPERINE $C_{17}H_{15}NO_3$.

1000 cc. sat. solution of piperine in water contain $1.4.10^{-3}$ gm. mol. or 0.400 gm. $C_{17}H_{19}NO_3$ at 18°. (Kolthoff, 1925.)

100 gms. abs. alcohol dissolve 6.66 gms. piperine at 20-25°.
» Quinoline » 13.66 » »
» Equi. mol. mixture of alcohol and quinoline dissolve 18.81 gms. piperine at 20-25°. (Pucher and Dehn, 1921.)

PIPERONAL $CH_2<O_2>C_6H_3.CHO$.

100 gms. Carbon Tetrachloride dissolve 69.5 gms. $CH_2<O_2>C_6H_3.CHO$ at 20°.
» Chloroform » 200.8 » » (Pawlewski, 1914, 1926.)

PIPERONYLIC ACID $CH_2<O_2>C_6H_3.COOH$.

Distribution of Piperonylic Acid at 25° Between: (Smith, 1921, 1922.)

Water and Chloroform.

Millimols. $CH_2<O_2>C_6H_3COOH$ per liter of H_2O layer (C_1).	Millimols. $CH_2<O_2>C_6H_3COOH$ per liter of $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.175	0.5812	3.32
0.2187	0.8125	3.71
0.250	1.0375	4.15

Water and Xylene.

Millimols. $CH_2<O_2>C_6H_3COOH$ per liter of H_2O layer (C_1).	Millimols. $CH_2<O_2>C_6H_3COOH$ per liter of Xylene layer (C_2).	$\frac{C_2}{C_1}$.
0.3595	0.3142	0.875
0.660	0.779	1.182
0.865	1.14	1.32

POTASSIUM ACETATE CH_3COOK.

Determinations of the freezing-points of aqueous solutions of potassium acetate made in a Beckmann apparatus gave the following results:

t°	—2.15.	—3.36.	—9.32.	—12.32.	—17.92.
Gms. CH_3COOK per 100 gms. sat. sol...	5.00	7.42	17.04	20.53	25.5

The solid phase was ice in all cases. (Sidgwick and Gentle, 1922.)

100 gms. aq. 86.5 % Glycerol ($d = 1.2326$) dissolve 77.4 gms. CH_3COOK at 20°.
» » 98.5 % » ($d = 1.2645$) » 65.5 » » (Holm, 1921, 1922.)

Data for the freezing-points of mixtures of potassium acetate (m. pt. 295) and sodium acetate (m. pt. 320) are given by Baskof, 1915, 1917. The salts form solid solutions in all proportions and no eutectic point was obtained. The lowest f. pt., 233°, was found for a mixture containing 46 mol. per cent CH_3COONa.

POTASSIUM AMIDE KNH_2.

Data for the freezing-points of mixtures of potassium amide and sodium amide are given by Kraus, 1923.

POTASSIUM ARSENITES $K_2As_4O_7$, $K_6As_4O_9.12H_2O$.

Equilibrium in the System Potassium Oxide, Arsenic Trioxide and Water at 25°. (Schreinemakers and De Baat, 1920.)

For saturation 4 to 6 weeks agitation at 25° was employed.

Gms. per 100 gms. sat. sol. As_2O_3.	Gms. per 100 gms. sat. sol. K_2O.	Solid Phase.	Gms. per 100 gms. sat. sol. As_2O_3.	Gms. per 100 gms. sat. sol. K_2O.	Solid Phase.
2.02	0.0	As_2O_3	48.96	24.16	$D_{3.2.12}$
22.63	5.61	»	44.84	23.61	»
36.29	8.79	»	39.49	23.49	»
41.93	9.69	»	33.60	24.07	»
54.02	11.62	»	24.16	28.05	»
58.11	13.74	$D_{1.2}$	20.98	32.93	»
53.49	15.24	»	22.47	35.96	»
49.58	17.28	»	29.61	38.32	»
49.21	18.61	»	23.82	42.48	$KOH.H_2O$
49.02	20.19	»	17.57	43.52	»
49.47	22.01	(?)	11.53	44.13	$KOH.2H_2O$
49.65	23.00	(?)	0.0	45.5	»

$D_{1.2} = K_2As_4O_7 = K_2O(As_2O_3)_2$, $D_{3.2.12} = K_6As_4O_9.12H_2O = (K_2O)_3(As_2O_3)_2.12H_2O$

POTASSIUM AZIDE KN_3.

100 gms. Alcohol ($d_{17} = 0.799$) dissolve 0.16 gm. KN_3 at 0° and 0.54 gm. at b. pt.
» » (80 per cent) » 1.8 » » » » 5.9 » »
» Benzene » 0.15 » » » b. pt.

(Cranston and Livingstone, 1926.)

POTASSIUM BENZOATE C_6H_5COOK.

Solubility of Potassium Benzoate in Water.

(Sidgwick and Ewbank, 1922.)

t°.	Gms. C_6H_5COOK per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. C_6H_5COOK per 100 gms. sat. sol.	Solid Phase.
— 0.86.....	5.04	Ice	41.0.....	44.92	C_6H_5COOK
— 2.14.....	9.70	»	81.0.....	50.99	»
— 4.29.....	16.23	»	97.5.....	53.50	»
— 7.31.....	24.23	»	131.0.....	58.42	»
+ 8.5.....	39.89	C_6H_5COOK	181.0.....	66.09	»
13.0.....	40.60	»			

POTASSIUM Hydroxy BENZOATES *o*, *m* and *p* $C_6H_4OHCOOK$.

Solubility of Potassium Ortho Hydroxy Benzoate (= Potassium Salicylate) in Water.

(Sidgwick and Ewbank, 1922.)

t°.	Gms. $C_6H_4OH.COOK$ (*o*) per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $C_6H_4OH.COOK$ (*o*) per 100 gms. sat. sol.	Solid Phase.
—1.82...	10.49	Ice	24.0...	53.33	$C_6H_4OHCOOK.H_2O$
—3.47...	18.82	»	28.5...	55.82	»
—6.52...	31.15	»	61.0...	61.31	$C_6H_4OHCOOK$
—8.0....	35.80	»	103.8...	68.97	»
—0.....	44.08	$C_6H_4OHCOOK.H_2O$	108.5...	70.20	»
9.....	49.19	»	138.2...	74.80	»

Solubility of Potassium Meta Hydroxy Benzoate in Water.

t_3.	Gms. $C_6H_4OH.COOK$ (*m*) per 100 gms. sat. sol.	Solid Phase.
— 2.41...	12.39	Ice
— 5.06...	22.25	»
— 8.59...	31.34	»
— 19.92...	49.39	»
+ 10.0....	59.04	$C_6H_4OH.COOK$ *m*
33.5....	61.94	»
95.0....	69.60	»
136.8....	75.02	»

Solubility of Potassium Para Hydroxy Benzoate in Water.

t°.	Gms. $C_6H_4OH.COOK$ (*p*) per 100 gms. sat. sol.	Solid Phase.
— 1.43...	8.04	Ice
— 3.24...	15.55	»
+ 15.8....	29.91	(*p*) $C_6H_4OH.COOK.2H_2O$
25.8....	35.50	»
43.0....	45.71	»
64.4. ..	56.70	»
70.5....	59.34	»
86.8....	63.01	(*p*) $C_6H_4OH.COOK$
129.5....	64.95	»

POTASSIUM BROMIDE KBr.

Freezing-Points of Aqueous Solutions of Potassium Bromide.

(Klein and Svanberg, 1920; Rodebush, 1918.)

t°.	Gms. KBr per 100 cc. sat. sol.		t°.	Gms. KBr per 100 gms. H_2O.	t°.	Gms. KBr per 100 gms. H_2O.
—0.348....	1.19	(K and S)	—3.19.....	11.53	—10.55.....	38.33
—0.863....	2.975	»	—5.61.....	20.42	—10.90.....	39.50
—1.694....	5.95	»	—6.57.....	23.82	—12.6Eutec...	45.65
			—8.51.....	30.87		

100 gms. water dissolve 72.56 gms. K Br at 32°.4 (Joseph, 1920.)

1000 cc. sat. solution of potassium bromide in water contain 4.278 gm. mols. K Br at 10°.2 and 4.391 gm. mols. at 19°.9. (Zeitlin, 1926.)

Constant agitation was not employed.

Solubility of Potassium Bromide in Bromine Water at 32°.4

(Joseph, 1920.)

The mixtures were constantly agitated in a thermostat for 24 hours.

d of sat. sol.	Gms. per 100 gms. H_2O	
	Br.	K Br.
1.3917	0.0	72.56
1.4063	2.40	73.39
1.4070	3.21	73.82
1.4132	3.96	74.07
1.4356	7.43	75.02
1.4633	12.09	76.43
1.4753	13.72	77.11
1.5236	22.97	80.13
1.5980	38.21	84.59
2.596	430.4	210.4*
2.860	1472.0	279.6*

* In these two cases the mixtures were simply left in bottles for some days at about 28°, and the heavy dark liquid filtered through glass wool and analyzed. The densities were taken by means of a Westphal balance.

Solubility of Potassium Bromide in Aqueous Solutions of Potassium Hydroxide at 20°. (Brönsted, 1920 *a*.)

Gm. mols. per liter.	
KOH.	K Br.
7.90	1.012
9.41	0.693
10.95	0.512
11.10	0.451
12.19	0.348
12.92	0.306
13.84	0.247
14.02	0.246
14.85	0.214
15.02	0.210

Solubility of Mixtures of Potassium Bromide and Silver Bromide in Water.

(Lambert, 1926.)

The mixtures were constantly stirred in a thermostat.

t°.	Gms. per 100 gms. sat. sol.		Solid Phase.
	Ag Br.	K Br.	
−13....	1.67	39.87	Ag Br + K Br
+30....	1.636	39.54	»
40....	2.24	40.88	»
50....	3.25	43.09	»
50....	3.12	42.43	»
60....	4.20	44.24	»
70....	5.80	45.48	Ag Br + K Br
70....	5.60	45.53	»
80....	6.72	46.91	»
90....	8.47	48.15	»
90....	9.00	47.98	»
100....	10.55	48.66	»

Solubility of Potassium Bromide in Aqueous Solutions of Ethyl Alcohol and of Methyl Alcohol. (Zeitlin, 1926.)

The mixtures were agitated frequently by hand during 5 days. The temperatures remained constant to 1°.

Results for Methyl Alcohol.

Wt. per cent CH_3OH in solvent.	Gm. mols. K Br per liter at	
	10°.2.	19°.9.
25.96	2.475	2.493
45.13	1.426	1.466
74.88	0.411	0.434
100.00	0.1376	0.142

Results for Ethyl Alcohol.

Wt. per cent C_2H_5OH in solvent.	Gm. mols. K Br per liter at	
	10°.2.	19°.9.
25.07	2.327	2.437
50.01	1.016	1.161
75.03	0.2704	0.2955
97.03	–	0.0114

100 gms. aq. 50 wt. % ethyl alcohol dissolve 16.4 gms. K Br at 20°.

(Wright, 1926.)

100 gms. Glycerol of $d = 1.2326$ (= 86.5 %) dissolve 20.59 gms. K Br at 20°.
» » $d = 1.2645$ (= 98.5 %) » 17.15 » »

(Holm, 1921, 1922.)

100 cc. sat .solution of potassium bromide in ethyl urethan (m. pt. 49°.6) contain 0.387 gms. K Br at 60°. (Stuckgold, 1917.)

Fusion-point data are given for the following mixtures :

Potassium bromide + Potassium chloride (Tammann and Krings, 1923.)
» » + Rubidium chloride » »
» » + Silver bromide (Zemczuzny, 1926.)
» » + Strontium bromide (Kellner, 1917.)

POTASSIUM StannoBROMIDES Mono $KSnBr_3.H_2O$, Tetra $K_4SnBr_4.H_2O$.

Solubility of Mono Potassium Stanno Bromide in Water.
(Rimbach and Fleck, 1916.)

t°.	Gms. per 100 gms. sat. sol. Br	+ Sn	+ K	= $SnBr_3K$	Solid Phase.
0.2*.....	11.21	3.88	2.94		$KSnBr_3.H_2O + SnBr_3.H_2O$
17.1*.....	16.17	6.05	3.94		» »
36.3*.....	24.56	10.84	4.90		» »
46.3.....	30.83	15.22	5.09	51.14	$KSnBr_3.H_2O$
74.6.....	40.88	20.24	6.70	67.82	»

Solubility of Tetra Potassium Stanno Bromide in Water.
(Rimback and Fleck, 1916.)

t°.	Gms. per 100 gms. sat. sol. Br	+ Sn	+ K	Solid Phase.
0.3*.....	19.26	1.00	8.77	$K_4SnBr_4.H_2O + SnBr_3.H_2O$
16.4*.....	28.62	2.33	12.48	» »
43.3*.....	33.38	4.28	13.52	» »
62.1*.....	39.43	8.44	13.75	» »
77.1*.....	43.76	12.73	13.03	» »

* At these temperatures the atomic ratios of the constituents in solution do not correspond to the double compound, hence the solid phase is not a single substance.

POTASSIUM Salt of CARYOPHYLLIN $KC_{30}H_{49}O_4.1^1/_2H_2O$.

100 gms. Ethyl alcohol dissolve 2.78 gms. of the salt at 20°.
» Methyl alcohol » 40.0 » » » (Dodge, 1918.)

POTASSIUM BiCARBONATE $KHCO_3$.

Freezing-Points of Aqueous Solutions of Potassium Bicarbonate.
(Foerster, Brosche and Norberg-Schulz, 1921.)

t° of f. pt.	−0.70.	−1.77.	−2.16.	−3.21.	−3.99.	−5.43.
Gms. $KHCO_3$ per 100 gms. sat. sol.....	2.17	5.47	5.77	9.98	12.60	16.95

POTASSIUM CARBONATE $K_2CO_3.2H_2O$.

100 gms. sat. solution of potassium carbonate in water contain 52.01 gms. K_2CO_3 at 16.5° and 52.8 gms. at 19°.5. (Rubtzov, 1918.)

Solubility of Potassium Carbonate in Aqueous Solutions of Potassium Chlorate and Vice Versa at 24°.2 and at 40°. (Iljinsky, 1924.)

Note. — Saturation was secured by active shaking at constant temperature. The attainment of equilibrium was controlled by successive density determinations and by analyses. In most cases the time required was 3 to 5 hours. For the triple points and those corresponding to double salts, several days were required. The solid phases were identified by analysis.

d of sat. sol.	Gms. per 100 gms. H_2O. $KClO_3$.	K_2CO_3.	Solid Phase.
	Results at 24°.2.		
1.550	0.0	112.6	$K_2CO_3.2H_2O$
	0.35	111.6	»+$KClO_3$
-	0.5	97.5	$KClO_3$
-	0.35	96.8	»
1.500	0.55	95.2	»
1.362	1.10	58.3	»
1.362	1.15	56.5	–
1.302	1.60	44.7	»
1.220	2.20	31.3	»
1.218	2.40	29.3	»
–	2.90	23.4	$KClO_3$
1.180	3.00	22.3	»
1.100	4.50	10.1	»
1.045	8.10	0.0	»
	Results at 40°.		
1.558	0.0	119.3	$K_2CO_3.2H_2O$
1.539	2.2	109.8	»+$KClO_3$
1.316	2.1	42.2	$KClO_3$
1.195	5.5	24.4	»
1.073	14.2	0.0	»

EQUILIBRIUM IN THE SYSTEM POTASSIUM CARBONATE, POTASSIUM CHLORATE, SODIUM CARBONATE, SODIUM CHLORATE AND WATER AT 24°.2. (Iljinski, 1924.)

See note under Potassium carbonate on previous page.

d of sat. sol.	Gms. per 100 gms. H_2O				Solid Phase.
	K_2CO_3.	$KClO_3$.	Na_2CO_3.	$NaClO_3$.	
–	0.0	1.5	22.0	68.9	$NaClO_3 + Na_2CO_3.7H_2O$
–	0.0	2.6	22.2	66.9	» $+ KClO_3$
1.383	0.0	0.0	24.6	46.2	$Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$
–	0.0	2.5	24.5	45.0	» » $+ KClO_3$
1.398	27.7	0.7	33.6	0.0	» $+ Na_2CO_3.K_2CO_3.6H_2O + KClO_3$
1.516	89.9	0.6	7.7	0.0	$K_2CO_3.2H_2O + Na_2CO_3.K_2CO_3.6H_2O + KClO_3$
1.510	90.7	0.5	6.7	0.0	» $+ KClO_3$
1.530	92.8	0.4	6.0	0.0	» »
1.528	100.7	0.8	1.3	0.0	» »
1.552	111.6	0.3	0.0	0.0	» »
–	0.0	2.6	22.2	66.9	$NaClO_3$ + » $+ Na_2CO_3.7H_2O$
1.442	0.0	5.1	6.6	88.2	» »
1.389	0.0	5.9	3.8	90.6	» »
1.443	0.0	5.1	1.5	95.7	» »
1.450	0.0	4.6	1.4	96.0	» »
1.432	0.0	4.2	0.0	96.6	» »
–	0.0	2.5	24.5	45.0	$Na_2CO_3.10H_2O$ + » $+ Na_2CO_3.7H_2O$
1.332	0.0	3.2	26.0	29.1	» »
–	0.0	7.2	30.7	0.0	» »
1.398	27.7	0.7	33.6	0.0	» » $+ Na_2CO_3.K_2CO_3.6H_2O$
1.433	54.1	0.6	15.2	0.0	» + »
1.516	89.9	0.6	7.7	0.0	$K_2CO_3.2H_2O$ + » + »
	0.0	2.6	22.2	66.9	$NaClO_3$ + » $+ Na_2CO_3.7H_2O$
–	0.0	2.5	24.5	45.0	$Na_2CO_3.10H_2O$ + » »

EQUILIBRIUM IN THE SYSTEM POTASSIUM CARBONATE, SODIUM CARBONATE, POTASSIUM CHLORIDE, SODIUM CHLORIDE AND WATER AT 25°. (Blasdale, 1923.)

Gms. per 100 gms. H_2O				Solid Phase.
K_2CO_3.	K_2Cl_2.	Na_2CO_3.	Na_2Cl_2.	
113.57	0.0	0.0	0.0	$K_2CO_3\ ^3/_2H_2O$
104.18	0.0	10.89	0.0	» $+ NaKCO_3.6H_2O$
30.48	0.0	35.57	0.0	$Na_2CO_3.7H_2O$ + »
18.96	0.0	35.63	0.0	» $+ Na_2CO_3.10H_2O$
0.0	0.0	25.67	23.51	NaCl + »
0.0	16.29	0.0	29.88	» + KCl
110.68	2.07	0.0	0.0	$K_2CO_3\ ^3/_2H_2O$ + »
0.0	13.78	27.45	15.81	$Na_2CO_3.10H_2O$ + » + NaCl
25.79	0.0	27.04	10.59	» + » $+ Na_2CO_3.7H_2O$
29.78	0.0	27.86	8.55	$NaKCO_3.6H_2O$ + » + »
102.50	1.83	11.02	0.0	» + » $+ K_2CO_3\ ^3/_2H_2O$
36.29	0.0	27.82	0.0	»
33.64	9.78	25.79	0.0	» + KCl
0.0	22.08	38.65	0.0	$Na_2CO_3.10H_2O$ + »

Solubility of Potassium Carbonate in Aqueous Solutions of Sodium Carbonate and Vice Versa at Several Temperatures.

(Iljinsky, 1924.)

See note under Potassium carbonate, p. 1354.

Gms. per 100 gms. H_2O.		
K_2CO_3.	Na_2CO_3.	Solid Phase.
	Results at −6°.	
84.4	0.0	$K_2CO_3.xH_2O$
54.0	6.9	»+$K_2CO_3.Na_2CO_3.2H_2O$
38.1	6.7	$K_2CO_3.Na_2CO_3.2H_2O$
25.4	11.7	»+$Na_2CO_3.10H_2O$
	Results at +10°.	
108.4	0.0	$K_2CO_3.2H_2O$
105.3	6.1	$K_2CO_3.Na_2CO_3.6H_2O$
50.0	10.8	»
35.4	17.6	$Na_2CO_3.10H_2O$
0.0	12.0	»
	Results at 24°.2.	
112.6	0.0	$K_2CO_3.2H_2O$
110.1	2.5	»
108.5	9.5	»
107.4	11.2	»+$K_2CO_3.Na_2CO_3.6H_2O$
98.3	13.8	$K_2CO_3.Na_2CO_3.6H_2O$
92.1	13.0	»
48.4	18.7	»
34.5	27.4	»
28.3	33.1	»

Gms. per 100 gms. H_2O.			
d of sat. sol.	K_2CO_3.	Na_2CO_3.	Solid Phase.
−	24.3	36.3	$K_2CO_3.Na_2CO_3.6H_2O$
−	24.0	38.0	»+$Na_2CO_3.10H_2O$
−	22.7	37.0	$Na_2CO_3.10H_2O$
−	15.0	35.4	»
−	0.0	28.5	»
	Results at 40°.		
1.558	119.3	0.0	$K_2CO_3.2H_2O$
1.556	110.0	8.4	»
−	107.0	11.2	»+$K_2CO_3.Na_2CO_3.6H_2O$
1.544	101.0	11.3	$K_2CO_3.Na_2CO_3.6H_2O$
1.527	87.0	16.3	»
1.500	82.6	16.2	»
1.445	48.5	27.2	»
1.400	32.2	33.1	»
1.389	26.7	35.5	»
1.385	25.9	35.7	»
1.381	23.8	36.5	»
−	21.0	41.0	»+$Na_2CO_3.H_2O$
1.356	15.2	43.1	$Na_2CO_3.H_2O$
1.360	10.0	44.6	»
−	0.0	49.0	»

Equilibrium in the System Potassium Carbonate, Sodium Carbonate, Potassium Sulfate, Sodium Sulfate and Water at 25°.

(Blasdale, 1923.)

Gms. per 100 gms. H_2O.				
K_2CO_3.	Na_2CO_3.	K_2SO_4.	Na_2SO_4.	Solid Phase.
0.0	27.44	0.0	24.06	$Na_2CO_3.10H_2O$ + $Na_2SO_4.10H_2O$
0.0	0.0	9.34	30.98	$K_3Na(SO_4)_2$ + »
0.0	0.0	13.31	6.86	» + K_2SO_4
3.58	26.09	0.0	25.46	» + $Na_2CO_3.10H_2O$ + $Na_2SO_4.10H_2O$
7.37	33.74	6.30	0.0	» + » + K_2SO_4
18.50	35.63	1.45	0.0	$Na_2CO_3.7H_2O$ + » + »
27.07	35.35	0.0	1.01	» + $KNaCO_3.6H_2O$ + »
103.72	10.83	1.36	0.0	$K_2CO_3.3/2H_2O$ + » + »
35.71	27.38	0.97	0.0	$KNaCO_3.6H_2O$ + K_2SO_4
0.0	41.65	9.40	3.31	$Na_2CO_3.10H_2O$ + $K_3Na(SO_4)_2$

100 gms. Aq. 86.5 % Glycerol (d = 1.2326) dissolve 40.5 gms. K_2CO_3 at 20°.
» 98.5 % » (d = 1.2645) » 39.4 » »

(Holm. 1921-1922.)

POTASSIUM CHLORATE $KClO_3$.

Solubility of Potassium Chlorate in Water.

Approximate determinations of the solubility of potassium chlorate in water are given by Alekceevsky, 1921. Small amounts of $KClO_3$ were added from time to time untill a further addition of 0.1 gm. failed to dissolve in 100 cc. of the solution within 3 hours.

t°.....	15°.	20°.	25°.	30°.	35°.	38°.
Gms. $KClO_3$ per 100 cc. sat. sol...	6.0	7.3	8.6	10.5	12.4	13.6

Approximate Solubility of Potassium Chlorate in Aqueous Salt Solutions at Several Temperatures. (Alekceevsky, 1921.)

The determinations were made by adding $KClO_3$ to the aqueous solvent untill no more dissolved after a period of 3 hours. The curves drawn from the results are very irregular, thus showing that saturation could not have been reached in all cases.

	Gms. $KClO_3$ per 100 cc sat. Solution in Aqueous.					
t°.	5 % K_2CO_3.	10 % K_2CO_3.	20 % K_2CO_3.	30 % K_2CO_3	40 % K_2CO_3.	50 % K_2CO_3.
20.....	6.0	5.0	4.0	2.5	2.0	1.0
30.....	6.5	6.0	5.0	3.5	2.5	2.5
40.....	8.5	8.0	6.5	4.5	4.5	3.5
50.....	9.5	9.0	7.5	6.0	6.0	4.0

	Gms. $KClO_3$ per 100 cc sat. Solution in Aqueous.		
t°.	5 to 7 % Na_2CO_3.	5 % Na Cl.	30 % Na Cl.
20.....	5.0	5.0	5.0
30.....	5.5	5.5	5.5
40.....	7.5	7.5	6.5
50.....	10.5	13.0	11.5

Solubility of Potassium Chlorate in Aqueous Solutions of Potassium Hydroxide at 20°. (Brönsted, 1920 *a*.)

Gm. mols. per liter.		Gm. mols. per liter.		Gm. mols. per liter.	
KOH.	$KClO_3$.	KOH.	$KClO_3$.	KOH.	$KClO_3$.
4.71	0.0924	8.60	0.0410	14.02	0.0215
5.06	0.0882	9.41	0.0351	14.85	0.0195
6.35	0.0609	10.95	0.0287	15.02	0.0191
7.95	0.0445	12.19	0.0254		

Solubility of Potassium Chlorate in Aqueous Solutions of Potassium Nitrate and Vice Versa at 25°. (Toda, 1921 *a*, 1922.)

Saturation was secured by constant rotation in a thermostat.

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
KNO_3.	$KClO_3$.	Solid Phase.	KNO_3.	$KClO_3$.	Solid Phase.
0.0	7.745	$KClO_3$	18.97	4.39	$KClO_3.NO_3$
0.68	7.65	$KClO_3.NO_3$	27.14	3.90	»
1.55	7.07	»	27.14	3.90	$KClO_3 + KNO_3$
3.59	6.52	»	27.21	3.61	KNO_3
7.12	5.76	»	27.57	1.63	»
12.81	5.10	»	27.24	0.0	»

Solubility of Potassium Chlorate in Aqueous Solutions of Sodium Chlorate and Vice Versa at 24°.2. and at 40°. (Iljinsky, 1924.)

See note under Potassium carbonate, p. 1354.

		Gms. per 100 gms. H_2O.					Gms. per 100 gms. H_2O.		
t°.	*d* of sat. sol.	$NaClO_3$.	$KClO_3$.	Solid. Phase.	t°.	*d* of sat. sol.	$NaClO_3$.	$KClO_3$.	Solid. Phase.
24.2..	1.045	0.5	8.1	$KClO_3$	24.2..	1.441	99.7	3.1	$KClO_3 + NaClO_3$
» ..	1.086	7.5	8.0	»	» ..	1.429	98.6	0.0	$NaClO_3$
» ..	1.189	27.5	7.0	»	40....	1.073	0.0	14.2	$KClO_3$
» ..	1.241	41.0	6.0	»	» ..	–	13.5	9.9	»
» ..	1.260	47.4	5.0	»	» ..	1.268	48.4	7.0	»
» ..	1.326	60.0	5.2	»	» ..	1.308	58.7	7.0	»
» ..	1.329	61.8	5.6	»	» ..	1.453	98.8	7.0	»
» ..	1.392	82.7	5.3	«	» ..	1.483	116.0	7.2	» + $NaClO_3$
					» ..	1.462	116.4	0.0	$NaClO_3$

100 gms aq. 86.5 % Glycerol ($d = 1.2326$) dissolve 1.32 gms $KClO_3$ at 20°.
" " 98.5 % " ($d = 1.2645$) " 1.03 " " "
(Holm, 1921, 1921 *a*, 1922.)

POTASSIUM PerCHLORATE $KClO_4$.

1000 cc. sat. solution of potassium perchlorate in water contain 16.82 gms. $KClO_4$ at 20°. (Moser and Ritschel, 1925.)

Solubility of Potassium Perchlorate in Aqueous Salt Solutions at 25°.
(Bozorth, 1923.)

Saturation was obtained by constant agitation, and approaching equilibrium from above and from below. The salt content of the solvents was determined by evaporation and drying the residue at 200°. The salt content of the saturated solutions was determined in the same manner and the difference ascribed to dissolved perchlorate.

Salt.	Gm. Equiv. Salt. per 1000 gms. H_2O.	Gm. Equiv. $KClO_4$ per 1000 gms. H_2O.	Salt.	Gm. Equiv. Salt. per 1000 gms. H_2O.	Gm. Equiv. $KClO_4$ per 1000 gms. H_2O.
None = H_2O..	0.0	0.1491 (=20.67 gms.)	$NaNO_3$ ...	0.1008	0.1611
KCl.....	0.0983	0.1136	" ...	0.3139	0.1790
"	0.2994	0.0757	" ...	0.6220	0.1994
"	0.6089	0.0535	K_2SO_4....	0.0998	0.1194
KNO_3.....	0.0971	0.1174	"	0.3025	0.0857
"	0.2954	0.0846	"	0.6008	0.0644
"	0.6686	0.0642	Na_2SO_4...	0.1047	0.1633
$NaClO_4$.....	0.1026	0.1122	" ...	0.3210	0.1800
"	0.3090	0.0752	" ...	0.6610	0.1957
"	0.6273	0.0533	$BaCl_2$.....	0.0991	0.1569
NaCl.....	0.1007	0.1567	"	0.2974	0.1638
"	0.2994	0.1558	"	0.5995	0.1693
"	0.5903	0.1732	$Ba(NO_3)_2$.	0.0990	0.1605
			" .	0.3019	0.1747
			" .	0.6075	0.1902

Solubility of Potassium Perchlorate in Aqueous Solutions of Ethyl Alcohol at 14°.
(Pierrat, 1921.)

Saturation was obtained by constant agitation for several hours. The saturated solution was evaporated to dryness in a current of air and the residue dissolved in enough water to yield the original volume of the solution. The salt content of this solution was then determined by electrolytic conductivity measurement.

Wt. per cent C_2H_5OH in solvent.	Gms. $KClO_4$ per liter sat. sol.	Wt. per cent C_2H_5OH in solvent.	Gms. $KClO_4$ per liter sat. sol.
0.0	12.4	42.4	3.9
7.1	9.2	58.5	2.6
13.2	7.8	94.7	0.15
27.3	5.7		

Solubility of Potassium Perchlorate in Several Solvents at 25°.
(Willard and Smith, 1923.)

Solvent.	$d_{\frac{25}{4}}$ of sat. sol.	Gms. $KClO_4$ per 100 gms. sat. sol.	Solvent.	$d_{\frac{25}{4}}$ of sat sol	Gms. $KClO_4$ 100 gms. sat. sol.
Water.....	1.0096	2.02	*n* Butyl alcohol..	0.8060	0.0045
Ethyl alcohol....	0.7852	0.012	*iso* " ..	0.7981	0.005
Methyl alcohol..	0.7878	0.105	Acetone.....	0.7868	0.155
n Propyl alcohol.	0.8011	0.010	Ethyl acetate....	0.8945	0.0015

SOLUBILITY OF POTASSIUM PERCHLORATE IN NORMAL BUTYL ALCOHOL, ETC, AT 25° ± 3. (Smith, 1923 *a*.)

Composition of solvent.			Milligrams	Composition of solvent.			Milligrams
Per cent Pure *n* Butyl alcohol.	Per cent $HClO_4 2H_2O$.	Per cent H_2O.	$KClO_4$ per 100 cc. sat. sol.	Per cent Pure *n* Butyl alcohol.	Per cent $HClO_4 2H_2O$.	Per cent H_2O.	$KClO_4$ per 100 cc. sat. sol.
100	0.0	0.0	1.35	99.0	0.0	1.0	2.0
99.75	0.25	0.0	1.00	97.0	0.0	3.0	3.8
99.5	0.5	0.0	1.00	96.0	1.0	3.0	1.6
99.0	1.0	0.0	1.9	96.5	0.5	3.0	1.2
98.0	1.0	1.0	1.4	94.0	1.0	5.0	2.3

100 cc. pure ethyl acetate dissolve 1.3 mg. $KClO_4$ at 25°. (Smith, 1925.)

SOLUBILITY OF POTASSIUM PERCHLORATE IN MIXTURES OF ETHYL ACETATE AND ALCOHOLS AT 25°. (Smith, 1925.)

Composition of solvent.			Gms. $KClO_4$ per 100 gms. sat. sol.
90 Vol. % $CH_3COOC_2H_5$	+ 10 Vol. %	CH_3OH	0.35
85 »	+ 15 »	»	0.52
80 »	+ 20 »	»	0.55
90 »	+ 10 »	C_2H_5OH	0.16
85 »	+ 15 »	»	0.26
80 »	+ 20 »	»	0.33
90 »	+ 10 »	of 93 % C_2H_5OH	0.28
85 »	+ 15 »	» »	0.44
80 »	+ 20 »	» »	0.50
90 »	+ 10 »	*n* Butyl alcohol	0.24
85 »	+ 15 »	»	0.20
80 »	+ 20 »	»	0.25

POTASSIUM CHLORIDE KCl.

FREEZING-POINTS OF AQUEOUS SOLUTIONS OF POTASSIUM CHLORIDE. (Klein and Svanberg, 1920; Rodebush, 1918.)

t°.	Gms. KCl per 100 cc. sat. sol.		t°.	Gms. KCl per 100 gms. H_2O.	t°.	Gms. KCl per 100 gms. H_2O.
−0.34	0.7456	(K and S)	−3.07	7.09	−9.84	22.69
−0.858	1.864	»	−4.66	10.77	−10.34	23.80
−1.681	3.728	»	−7.51	17.38	−10.66 (eutec.)	24.60

THE SOLUBILITY OF POTASSIUM CHLORIDE IN AQUEOUS SOLUTIONS OF MIXTURES OF OTHER SALTS.

The polytherms of the four salt points of the potassium chloride field in quinary systems of oceanic salt deposits have been redetermined with great care by Dr. Serowy, 1923. This is a repetition and extension of the fundamental work of Van't Hoff, D'Ans and others. Results at temperatures between 0° and 120° are given for the equilibrium solution Q (Van't Hoff) in contact with K Cl + Na Cl + carnellite + kainite or kiesierite; at temperatures between 60.5° and 120° for the equilibrium solution P in contact with K Cl + Na Cl + glaserite + langbeinite; between 0° and 120° for the equilibrium solution F in contact with K Cl + Na Cl + glaserite; between 0° and 120° for the equilibrium solution E in contact with K Cl + Na Cl + carnellite and between 23° and 120° for the equilibrium solution R in contact with Na Cl + kainite + kiesierite + carnallite and with K Cl + Na Cl + kiesierite + langbeinite. For additional references see also magnesium chloride, p. 1283.

SOLUBILITY OF POTASSIUM CHLORIDE IN AQUEOUS SOLUTIONS OF POTASSIUM HYDROXIDE AT 20°. (Brönsted, 1920 *a*.)

Gm. mols. per liter.		Gm. mols. per liter.		Gm. mols. per liter.	
KOH.	KCl.	KOH.	KCl.	KOH.	KCl.
4.71	1.605	11.10	0.253	14.02	0.136
7.90	0.712	12.19	0.191	14.85	0.121
9.41	0.405	12.92	0.168	15.02	0.118
10.95	0.273	13.84	0.138		

Solubility of Potassium Chloride in Aqueous Solutions of Potassium Hydroxide at Various Temperatures. (von Antropoff, 1924.)

Gms. KOH per 100 gms. sat. sol.	Gms. KCl per 100 gms. sat. solution at					
	-21°3.	-11°1.	0°.	10°.	20°.	30°.
5	–	15.4(1.180)	17.6(1.185)	19.2(1.184)	20.8(1.180)	22.2(1.182)
10	–	11.7(1.189)	13.5(1.194)	15.0(1.203)	16.4(1.201)	17.9(1.204)
15	7.9(1.204)	8.8(1.206)	9.9(1.219)	11.3(1.227)	12.3(1.226)	13.6(1.230)
20	5.6(1.239)	6.3(1.238)	7.2(1.249)	8.0(1.256)	8.8(1.252)	10.2(1.258)
25	3.6(1.280)	4.2(1.278)	4.9(1.283)	5.4(1.285)	6.2(1.283)	7.4(1.289)
30	2.2(1.326)	2.6(1.323)	3.0(1.322)	3.6(1.324)	4.2(1.318)	5.0(1.323)
35	1.2(1.376)	1.5(1.372)	1.8(1.370)	2.2(1.366)	2.6(1.362)	3.2(1.364)
40	0.7(1.430)	0.9(1.425)	1.0(1.419)	1.3(1.415)	1.5(1.411)	1.8(1.409)
45	0.4(1.486)	0.5(1.478)	0.6(1.471)	0.7(1.469)	0.9(1.465)	1.1(1.460)
50	–	–	–	0.5(1.525)	0.6(1.521)	0.8(1.515)
55	–	–	–	–	–	0.5(1.571)

Gms. KOH per 100 gms. sat. sol.	Gms. KCl per 100 gms. sat. solution at					
	50°.	70°.	90°.	120°.	150°.	180°.
5	24.7 (1.186)	27.3 (1.196)	29.7 (1.214)	33.0	36.0	38.3
10	20.2 (1.208)	22.7 (1.220)	24.8 (1.231)	27.9	30.8	33.1
15	16.0 (1.236)	18.4 (1.243)	20.0 (1.250)	22.9	25.8	28.1
20	12.3 (1.263)	14.4 (1.270)	15.9 (1.272)	18.0	21.2	23.5
25	9.1 (1.293)	10.8 (1.299)	12.1 (1.298)	14.5	17.0	19.1
30	6.3 (1.324)	7.7 (1.330)	9.1 (1.330)	11.3	13.8	15.3
35	4.1 (1.358)	5.3 (1.364)	6.6 (1.367)	8.8	10.5	12.1
40	2.5 (1.404)	3.7 (1.404)	4.5 (1.408)	6.7	8.0	9.3
45	1.6 (1.458)	2.5 (1.451)	3.1 (1.451)	5.0	6.0	7.1
50	1.1 (1.511)	1.7 (1.505)	2.2 (1.500)	3.3	4.4	5.5
55	0.9 (1.568)	1.1 (1.566)	1.8 (1.556)	2.5	3.4	4.7
60	–	–	1.4 (1.618)	2.0	2.7	4.0
65	–	–	–	1.7	2.5	3.9
70	–	–	–	–	2.7	–

The figures in parentheses are the densities of the saturated solutions.

Simultaneous Solubility of Potassium Chloride and Potassium Hydroxide at the Eutectic Temperatures. (von Antropoff, 1924.)

Eutec. temp.	Gms. per 100 gms. sat. sol. KOH.	KCl.	Solid Phase.	Eutec. temp.	Gms. per 100 gms. sat. sol. KOH.	KCl.	Solid Phase.
—21.30	11.23	9.69	KCl + ice	±0	48.93	0.44	$KOH.2H_2O$ + KCl
—17.35	10.62	10.24	»	10	50.69	0.45	» »
—11.0	–	19.74	»	20	52.83	0.55	» »
—67.2	30.73	0.23	$KOH.3H_2O$(?)+Ice	30	55.28	0.47	» »
—65.2	30.83	–	» »	50	58.09	0.67	$KOH.H_2O$ + »
—65.6	29.62	–	» »	70	59.63	0.91	» »
—64.3	30.59	0.43	» »+KCl	90	61.75	1.25	» »
—21.3	46.6	0.38	$KOH.2H_2O$ + KCl	120	65.31	1.70	» »
—11.1	47.45	0.38	» »	150	73.57	2.87	KOH+ »

SOLUBILITY OF POTASSIUM CHLORIDE IN AQUEOUS SOLUTIONS OF POTASSIUM HYDROXIDE AT THE BOILING POINTS. (von Antropoff, 1924.)

B. pt.	*d* of sat. sol.	Gms. per 100 gms. sat. sol. KOH.	KCl.	B. pt.	*d* of sat. sol.	Gms. per 100 gms. sat. sol. KOH.	KCl.
108.5	–	0.0	36.5	120.7	1.351	30.0	11.9
109.2	1.227	5.0	31.9	125.7	1.382	35.0	9.6
110	1.245	10.0	27.4	131.5	1.415	40.0	7.7
111.5	1.266	15.0	22.9	139.3	1.448	45.0	6.4
113.5	1.292	20.0	18.7	151.5	1.8	50.0	5.4
116.5	1.320	25.0	14.9	166.3	–	55.0	4.7

SOLUBILITY OF POTASSIUM CHLORIDE IN AQUEOUS SOLUTIONS OF POTASSIUM NITRATE AND VICE VERSA AT 30°. (Barbaudy, 1923.)

Gms. per 100 gms. sat. sol. KCl.	KNO_3.	Solid Phase.	Gms. per 100 gms. sat. sol. KCl.	KNO_3.	Solid Phase.
27.2	0.0	KCl	21.3	16.8	KNO_3
23.43	11.63	»	20.25	17.25	»
22.78	13.42	»	10.48	22.0	»
22.18	16.39	»	5.48	26.36	»
21.9	16.65	»+KNO_3	0.0	31.4	»

Data for equilibrium in the system potassium chloride + potassium oxalate + water at 20° are given by Trifnov, 1924-1925.

EQUILIBRIUM IN THE SYSTEM POTASSIUM CHLORIDE, POTASSIUM SULFATE, SODIUM CHLORIDE, SODIUM SULFATE AND WATER AT DIFFERENT TEMPERATURES: (Blasdale, 1918.)

Saturation was secured by constant stirring at constant temperature.

Results at 25°.

d of sat. sol.	Gms. per 100 gms. H_2O. KCl.	K_2SO_4.	NaCl.	Na_2SO_4.	Solid Phase.
1.212	–	–	–	27.93	Na_2SO_4
1.088	–	12.02	–	–	K_2SO_4
1.187	36.96	–	–	–	KCl
1.199	–	–	35.63	–	NaCl
1.282	–	9.31	–	30.97	Na_2SO_4+$K_3Na(SO_4)_2$(Glaserite)
1.149	–	13.24	–	6.69	K_2SO_4+ »
1.190	36.63	1.53	–	–	» +KCl
1.237	16.28	–	29.88	–	NaCl+ »
1.239	–	–	32.19	9.81	» +Na_2SO_4
1.243		–	18.82	21.68	$Na_2SO_4.10H_2O$+ »
1.273	–	7.32	14.28	22.28	» + » +$K_3Na(SO_4)_2$
1.200	29.38	2.23	6.78	–	KCl+K_2SO_4+ »
1.250	16.37	–	27.96	3.51	» + NaCl + »
1.266	–	11.04	34.90	2.25	Na_2SO_4+ » + »

Exactly similar results are also given for 0°, 50°, 75° and 100°.

SOLUBILITY OF POTASSIUM CHLORIDE IN AQUEOUS SOLUTIONS OF ETHYL AND METHYL ALCOHOL. (Zeitlin, 1926.)

The mixtures were allowed to stand 5 days with frequent agitation in a room which remained constant in temperature to 1°.

Solvent.	Gm. mols. KCl per liter at 10°.2.	19°.9.	Solvent.	Gm. mols. KCl per liter at 10°.2.	19°.9.
Water.....	3.712	3.903	Aq. 25.07 % Wt. C_2H_5OH..	1.607	1.755
Aq. 25.96 Wt. % CH_3OH...	1.700	1.896	» 50.01 »	0.5860	0.6004
» 45.13 »	0.8403	0.8700	» 75.03 »	0.1127	0.1245
» 74.88 »	0.1886	0.2121	» 97.3 »	0.00	0.0052
100.00 »	0.0520	0.0560			

100 gms. aq. 50 wt. % ethyl alcohol dissolve 6.0 gms. K Cl at 20°. (Wright, 1926).

DISTRIBUTION OF POTASSIUM CHLORIDE AT 17° BETWEEN: (Wosnessensky, 1925.)

Water and Amyl Alcohol.

Millimols. K Cl per liter of H_2O layer (C_1).	Alcohol layer (C_2).	$\frac{C_1}{C_2^{1.32}}$.
360.255	0.831	461
512.011	1.050	480
677.507	1.287	486
810.000	1.491	478
921.140	1.648	477

Water and Phenol.

Millimols. K Cl per liter H_2O layer (C_1).	Phenol layer (C_2).	$\frac{C_1}{C_2}$.
64.0	4.5	14.2
111.5	7.9	14.1
290.3	20.4	14.2
324.5	22.8	14.2

100 gms. sat. sol. of potassium chloride in selenium oxychloride ($Se O Cl_2$) contain 2.89 gms. K Cl at 25°. (Wise, 1923.)

100 cc. sat. sol. of potassium chloride in ethyl urethan contain 0.105 gm. K Cl at 60°. (Stuckgold, 1917.)

Fusion-point data for mixtures of K Cl + Na Cl are given by Schaeffer, 1919, Lautsberry and Page, 1920, and by Scholich, 1920. Results for K Cl + $Sr Cl_2$ and K Cl + $Sr Cl_2$ + Na Cl are given by Scholich, 1920.

Mono POTASSIUM Tin CHLORIDE $KSnCl_3.H_2O$.

SOLUBILITY OF MONO POTASSIUM STANNO CHLORIDE IN WATER.
(Rimbach und Fleck, 1916.)

t°.....	3°.2.	14°.2.	37°.5.	59°.4.	71°.0.
Gms. $KSnCl_3$ per 100 gms. sat. sol....	26.1	34.9	54.0	72.8	82.1

Solid phase $KSnCl_3.H_2O$ at all temperatures.

Di POTASSIUM Tin CHLORIDE $K_2SnCl_4.2H_2O$.

SOLUBILITY OF DI POTASSIUM STANNO CHLORIDE IN WATER.
(Rimbach and Fleck, 1916.)

t°.	Gms. per 100 gms. sat. sol. Cl.	Sn.	K.	K_2SnCl_4.	Solid Phase.
2.3*..	9.14	3.28	7.94	–	$K_2SnCl_4.?H_2O$
14.1*..	12.18	5.68	9.72	–	»
35.6...	18.28 +	14.56 +	10.61 =	43.5	$K_2SnCl_4.2H_2O$
57.4...	23.13 +	19.50 +	12.72 =	55.4	»
77.3...	26.56 +	22.35 +	14.63 =	63.5	»

Tetra POTASSSIUM Tin CHLORIDE $K_4SnCl_6.H_2O$.

SOLUBILITY OF TETRA POTASSIUM STANNO CHLORIDE IN WATER.
(Rimbach and Fleck, 1916.)

t°.	Gms. per 100 gms. sat. sol. Cl.	Sn.	K.	K_4SnCl_6.	Solid Phase.
0.5*..	10.99	0.93	11.55	–	$K_4SnCl_6.H_2O + SnCl_2.H_2O$
19.5*..	13.10	1.93	13.19	–	» »
41.0*..	16.00	5.82	13.84	–	» »
61.7*..	20.18	9.95	15.73	–	» »
70.0...	22.71 +	12.86 +	16.63 =	52.20	$K_4SnCl_6.H_2O$
81.2...	25.74 +	19.57 +	15.71 =	61.02	»

* At these temperatures the atomic ratios in solution did not correspond to the double salt hence the solid phase is a mixture of the double salt and stanno chloride.

POTASSIUM CHLORO PLATINATE K_2PtCl_6.

100 gms. of 2.0 normal aqueous K Cl solution dissolve 5.03 gms. $K_2 Pt Cl_6$ at 100°. (Archibald and Kern, 1917.)

Solubility of Potassium Chloro Platinate in Aqueous Alcohol at 14°. (Pierrat, 1921.)

Constant agitation for several hours was employed for securing saturation.

Wt. per cent C_2H_5OH in solvent.	Gms. K_2PtCl_6 per liter sat. sol.	Wt. per cent C_2H_5OH in solvent.	Gms. K_2PtCl_6 per liter sat. sol.
0.0	9.3	42.4	0.5
8.7	4.2	58.5	0.2
15.9	2.6	94.7	0.02
27.3	1.4		

POTASSIUM DiCHROMATE $K_2Cr_2O_7$.

Solubility of Potassium Dichromate in Aqueous Solutions of Sodium Dichromate and Vice Versa. (Robertson, 1924.)

The mixtures of the two salts were dissolved in water at a higher temperature than that of the isotherm and the flasks then placed in a thermostat at the desired temperature. Constant agitation is not mentioned.

Results at 25°.		Results at 50°.		Results at 100°.		
Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Solid Phase
$Na_2Cr_2O_7$.	$K_2Cr_2O_7$.	$Na_2Cr_2O_7$.	$K_2Cr_2O_7$.	$Na_2Cr_2O_7$.	$K_2Cr_2O_7$.	at each temperature.
0.0	13.1	0.0	27.4	0.0	47.2	$K_2Cr_2O_7$
4.38	12.2	6.5	24.2	6.3	42.1	»
16.1	8.68	16.3	19.3	14.1	36.5	»
20.0	8.97	21.0	17.8	23.0	29.0	»
26.9	7.70	29.3	13.6	29.6	24.2	»
33.6	6.52	43.6	11.3	44.4	16.4	»
43.2	5.46	48.5	9.47	56.1	13.4	»
55.5	5.16	52.5	9.36	60.6	12.4	»
61.4	5.25	63.3	7.92	70.8	9.96	» $Na_2Cr_2O_7$
65.5	0.0	70.3	0.0	80.1	0.0	$Na_2Cr_2O_7$

Solubility of Potassium Dichromate in Aqueous Solutions of Potassium Chloride and Vice Versa. (Robertson, 1924.)

Results at 25°.		Results at 50°.		Results at 100°.		
Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Solid Phase
KCl.	$K_2Cr_2O_7$.	KCl.	$K_2Cr_2O_7$.	KCl.	$K_2Cr_2O_7$.	at each temperature.
2.1	10.0	2.4	25.8	0.0	47.2	$K_2Cr_2O_7$
4.3	8.3	4.6	21.3	3.5	42.1	»
6.32	6.53	6.6	18.9	7.2	37.1	»
8.2	5.5	8.6	16.7	11.4	32.2	»
10.0	4.55	10.6	14.9	15.6	27.6	»
11.6	3.9	11.9	13.2	22.1	20.6	»
13.0	3.36	13.3	12.4	24.9	18.2	»
15.7	2.6	14.8	11.0			»
18.6	2.2	18.1	8.8			»
21.2	1.7	21.4	6.8			»
23.0	1.57	24.0	5.7			»
26.0	1.2	28.9	4.1	27.6	16.2	» + KCl
	—	29.0	3.7	29.6	11.6	KCl
26.1	1.05	29.8	1.9	31.9	6.4	»
26.3	0.0	30.6	0.0	35.9	0.0	»

POTASSIUM CYANATE KCNO.

100 gms. alcohol of $d_{17} = 0.799$ dissolve 0.16 gm. KCNO at 0° and 0.53 gm. at b. pt.
» » 80 % concentration dissolve 1.9 gms. KCNO at 0° and 6.2 gms. at b. pt.
» benzene dissolve 0.18 gm. KCNO at b. pt. (Cranston and Livingstone, 1926.)

POTASSIUM CYANIDE KCN.

Solubility of Potassium Cyanide in Aqueous Solutions of Cadmium Cyanide at 25° and Vice Versa.

(Corbet, 1926.)

Note. — Saturation was secured by constant rotation in wax bottles for 1 or 2 days and then thoroughly grinding the solid and continuing the rotation for a further 4 or 5 days.

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
KCN.	$Cd(CN)_2$.	Solid Phase.	KCN.	$Cd(CN)_2$.	Solid Phase.
41.7	0.0	KCN	11.65	16.15	$K_2Cd(CN)_4$
40.67	0.82	$K_2Cd(CN)_4$	9.47	19.14	» + $Cd(CN)_2$
28.62	4.65	»	7.82	15.73	$Cd(CN)_2$*
17.79	10.70	»	4.68	10.21	» *
15.16	12.53	»	trace	0.36	» *

* The solid phase in these cases was undoubtedly a basic cadmium cyanide.

Solubility of Potassium Cyanide in Aqueous Solutions of Cuprous Cyanide at 25° and Vice Versa.

(Bassett and Corbet, 1924.)

Note. — Difficulty was experience in preparing KCN free from KOH. It was necessary to prepare the saturated solutions from double salts which could be obtained free of KOH. Constant rotation in wax bottles was employed. To eliminate errors due to oxidation, an atmosphere of coal gas, which had been previously washed by passing through solutions of lead acetate and sodium hydroxide was maintained in the bottles. Both the liquid and solid phases were analyzed.

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
KCN.	CuCN.	Solid Phase.	KCN.	CuCN.	Solid Phase.
41.7	0.00	KCN	22.32	14.71	$KCu(CN)_2$
40.53	2.16	»	19.95	13.78	»
40.31	4.20	»	12.10	8.84	»
41.70	5.84	$K_3Cu(CN)_4$	9.97	7.52	$KCu_2(CN)_3.H_2O$
35.96	10.86	»	6.05	3.93	»
33.86	15.30	»	6.03	3 88	»
41.94	6.13	$K_3Cu(CN)_4.H_2O$	4.21	1.87	»
36.24	12.92	»	3.27	1.68	»
34.82	18.47	»	1.34	0.60	»
35.28	22.52	»	0.42	trace	» + CuCN
34.77	22.59	$KCu(CN)_2$	trace	trace	CuCN

Solubility of Potassium Cyanide in Aqueous Solutions of Gold (Aurous) Cyanide at 25° and Vice Versa.

(Bassett and Corbet, 1924.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
KCN.	AuCN.	Solid Phase.	KCN.	AuCN.	Solid Phase.
41.7	0.00	KCN	9.66	2.97	$KAu(CN)_2$
42.02	trace	»	7.02	8.34	»
41.98	0.17	» + $KAu(CN)_2$	5.19	11.02	»
38.98	0.35	$KAu(CN)_2$	4.78	15.47	» + AuCN
24.04	0.76	»	2.60	7.27	AuCN
23.79	0.27	»	2.32	7.32	»
13.70	2.55	»	2.37	6.12	»

Solubility of Potassium Cyanide in Aqueous Solutions of Mercuric Cyanide at 25° and Vice Versa. (Corbet, 1926.) See notes preceding page.

Gms. per 100 gms. sat. sol. KCN.	Gms. per 100 gms. sat. sol. $Hg(CN)_2$.	Solid. Phase.	Gms. per 100 gms. sat. sol. KCN.	Gms. per 100 gms. sat. sol. $Hg(CN)_2$.	Solid. Phase.
41.7	0.00	KCN	12.81	39.96	$K_2Hg(CN)_4$
39.7	0.49	$KCN + K_2Hg(CN)_4$	11.37	41.85	$Hg(CN)_2$
29.47	2.34	$K_2Hg(CN)_4$	3.97	20.34	»
17.34	11.09	»	*1.09	13.53	»
14.54	15.54	»	*0.56	11.83	»
12.54	20.65	»	*0.28	10.89	»
12.51	31.19	»	*0.00	10.00	»

*Sherrill, *Z. Physik Chem.*, 43, 719, 1903.

Solubility of Potassium Cyanide in Aqueous Solutions of Nickel Cyanide at 25° and Vice Versa. (Corbet, 1926.) See notes preceding page.

Gms. per 100 gms. sat. sol. KCN.	Gms. per 100 gms. sat. sol. $Ni(CN)_2$.	Solid. Phase.	Gms. per 100 gms. sat. sol. KCN.	Gms. per 100 gms. sat. sol. $Ni(CN)_2$.	Solid. Phase.
39.85	1.00	KCN	23.97	10.82	$K_2Ni(CN)_4.H_2O$
38.79	1.88	»	23.14	10.34	»
37.64	4.69	»	16.82	14.29	»
*41.11	6.56	»	16.82	13.94	» + $Ni(CN)_2$
39.09	5.95	$KCN + K_2Ni(CN)_4.H_2O$	10.58	9.13	$Ni(CN)_2$
30.94	7.46	$K_2Ni(CN)_4.H_2O$	0.28	0.23	»

*Unstable equilibrium.

Solubility of Potassium Cyanide in Aqueous Solutions of Potassium Hydroxide at 25°. (Basset and Corbet, 1924.)

See note preceding page.

Gms. per 100 gms. sat. sol. KCN.	KOH*.	KCN + KOH.	Gms. per 100 gms. sat. sol. KCN.	KOH*.	KCN + KOH.
41.56	0.11	41.67	34.72	7.39	42.11
41.67	0.69	42.36	33.58	8.96	42.54
38.92	3.3	42.22	26.39	16.29	42.68

*In terms of KCN. These results show that KOH decreases the solubility of KCN in water. Hence accurate results require that KCN free of KOH must be used for solubility determinations.

Solubility of Potassium Cyanide in Aqueous Solutions of Silver Cyanide at 25° and Vice Versa. (Bassett and Corbet, 1924.) See note preceding page.

Gms. per 100 gms. sat. sol. KCN.	Gms. per 100 gms. sat. sol. AgCN.	Solid. Phase.	Gms per 100 gms sat. sol. KCN.	Gms per 100 gms sat. sol. AgCN.	Solid. Phase.
41.7	0.00	KCN	20.14	21.66	$KAg(CN)_2$
40.77	6.52	»	8.56	16.11	»
39.91	8.14	»	8.05	15.76	$KAg_2(CN)_3.H_2O$
40.24	10.93	»	8.93	17.73	»
40.44	13.71	$K_3Ag(CN)_4.H_2O$	6.75	13.53	AgCN
37.76	18.92	»	2.36	4.42	»
35.19	25.18	»	1.64	3.27	»
28.43	26.37	$KAg(CN)_2$	1.26	2.31	»
26.67	24.71	»	2.16	trace	»

SOLUBILITY OF POTASSIUM CYANIDE IN AQUEOUS SOLUTIONS OF THALLIUM CYANIDE AT 25° AND VICE VERSA. (Bassett and Corbet, 1924.) See Note, p. 1364.

Gms. per 100 gms. sat. sol. KCN.	Gms. per 100 gms. sat. sol. TlCN.	Solid Phase	Gms. per 100 gms. sat. sol. KCN.	Gms. per 100 gms. sat. sol. TlCN.	Solid Phase.
41.7	0.0	KCN	34.36	4.90	TlCN
40.83	0.71	»	35.09	4.96	»
39.76	1.65	»	31.25	4.46	»
37.0	3.17	» + $KTl(CN)_2$	30.21	5.00	»
37.5	3.11	$KTl(CN)_2$	28.07	4.47	»
36.47	4.16	»	21.00	4.36	»
36.52	4.12	»	14.75	5.46	»
35.93	5.78	»	9.12	7.17	»
36.00	4.99	TlCN	0.51	16.20	»
35.27	4.98	»	0.34	16.12	»
34.45	4.91	»	0.00	16.51	»

SOLUBILITY OF POTASSIUM CYANIDE IN AQUEOUS SOLUTIONS OF ZINC CYANIDE AT 25° AND VICE VERSA. (Corbet, 1926.) See Note, p. 1364.

Gms. per 100 gms. sat. sol. KCN.	Gms. per 100 gms. sat. sol. $Zn(CN)_2$.	Solid Phase.	Gms. per 100 gms. sat. sol. KCN.	Gms. per 100 gms. sat. sol. $Zn(CN)_2$.	Solid Phase.
41.7	0.00	KCN	18.22	0.47	$K_2Zn(CN)_4$
41.15	trace	» + $K_2Zn(CN)_4$	14.17	1.50	»
39.04	trace	$K_2Zn(CN)_4$	7.65	5.75	»
37.15	0.12	»	6.64	5.86	»
34.46	0.17	»	6.77	6.97	» + $Zn(CN)_2$
32.65	0.20	»	3.81	3.33	$Zn(CN)_2$
23.56	0.67	»	2.50	2.30	»

POTASSIUM Platino CYANIDE $K_2Pt(CN)_4.3H_2O$.

SOLUBILITY OF POTASSIUM PLATINO CYANIDE IN WATER. (Terrey and Jolly, 1923.

Saturation secured by constant stirring in a thermostat.

t°.	Gms. $K_2Pt(CN)_4$ per 100 gms. H_2O.	Solid Phase.	t°.	Gms. $K_2Pt(CN)_4$ per 100 gms. H_2O.	Solid Phase.
0.1.....	11.60	$K_2Pt(CN)_4.3H_2O$	45.0....	95.43	$K_2Pt(CN)_4.3H_2O$
9.8.....	19.76	»	49.9....	109.20	»
14.4.....	26.53	»	52.4 tr. pt.		» + $K_2Pt(CN)_4.2H_2O$
13.35 tr. pt.		» + $K_2Pt(CN)_4.3H_2O$	55.4....	127.5	$K_2Pt(CN)_4.2H_2O$
16.38....	28.63	$K_2Pt(CN)_4.3H_2O$	60.4....	139.1	»
17.42....	29.02	»	67.5....	156.9	»
20.05....	33.83	»	74.5 tr. pt.	175.2	» + $K_2Pt(CN)_4.2H_2O$
22.65....	37.73	»	78.2....	173.2	$K_2Pt(CN)_4.H_2O$
25.0.....	41.93	»	83.6....	178.3	»
35.0.....	64.16	»	87.2....	184.0	»
39.75....	78.23	»	95.0....	210.0	»

The transition temperatures (tr. pt.) were determined by the dilatometric method.

POTASSIUM FERROCYANIDE $K_4Fe(CN)_6.3H_2O$.

FREEZING-POINTS OF AQUEOUS SOLUTIONS OF POTASSIUM FERROCYANIDE. (Fabris, 1921.)

t°.	Gms. $K_4Fe(CN)_6$ per 100 gms. H_2O.	t°.	Gms. $K_4Fe(CN)_6$ per 100 gms. H_2O.	t°.	Gms. $K_4Fe(CN)_6$ per 100 gms. H_2O.	
—0.24.....	1.25	—0.86....	6.0	—1.50.....	12.0	
—0.36.....	2.0	—1.09....	8.0	—1.58 eutec.	12.8	(observed)
—0.62.....	4.0	—1.30....	10.0	—1.58 »	15.1	(by interpolation

Solubility of Potassium Ferrocyanide in Water.
(Fabris, 1921; Vallance, 1922; Farrow, 1926.)

Saturation was secured by constant agitation in a thermostat and equilibrium approached from above and from below. The density determinations are by Farrow.

t°.	*d* of sat. sol.	Gms. $K_4Fe(CN)_6$ per 100 gms. sat. sol.	t°.	*a* of sat sol.	Gms. $K_4Fe(CN)_6$ per 100 gms. sat. sol.
0....	–	12.48	40....	–	29.28
5....	–	17.95	45....	–	30.96
10.4..	–	17.51 (V)	50....	1.2350	32.64 (33.13 F)
13.8..	–	19.067 (V)	55....	–	34.10
15....	–	19.58	60....	–	35.55
16.9..	–	20.862 (V)	65....	1.2635	36.81 (36.94 F)
20....	–	21.93	70....	–	38.07
20.4..	–	21.953 (V)	75....	–	39.20
23.1..	–	23.074 (V)	80....	1.2854	40.29 (40.45 F)
24.9..	1.1731	23.95 (F)	85....	–	41.65
25....	–	23.971 (V)	90....	–	43.17
25....	–	24.10	95....	–	44.75
30....	–	25.94	99.7..	1.3115	43.78
35....	1.2018	27.79 (28.01 F)	100....	–	46.07

The solid phase was $K_4Fe(CN)_6.3H_2O$ in all cases except possibly at temperatures above about 80° where there appears to be a slight change in the direction of the curve.

POTASSIUM SilicoFLUORIDE K_2SiF_6.

Solubility in Aqueous Solutions of Ethyl Alcohol at 14°. (Pierrat, 1921.)
See Note under potassium cobaltinitrite, p. 1370.

Wt. per cent C_2H_5OH.	0.0.	8.7.	15.9.	27.3	42.4	94.7.
Gms. K_2SiF_6 per liter sat. sol.....	0.9	0.46	0.21	0.09	0.05	0.0096

POTASSIUM ZirconoFLUORIDE K_2ZrF_6 (See also Zirconium salts, p. 1500).

Solubility of Potassium Zircono Fluoride in Water. (Missenden, 1922.)

No information is given as to how the determinations were made and no explanation of the column heading « No of parts of water ». Presumably this is the grams of water required to dissolve one gram of the salt.

t°.	No of parts water.	t°.	No of parts water.	t°.	No of parts water.
10....	81.75	40....	42.25	80....	14.50
20....	64.50	50....	34.00	90....	9.00
30....	52.00	60....	26.25	100....	4.25
		70....	19.75		

POTASSIUM HELIANTHATE $KC_{14}H_{14}N_3SO_3.2H_2O$.

1000 cc. H_2O dissolve 4.368 gms. $KC_{14}H_{14}N_3SO_3.2H_2O$ at 20-25°.
(Stark and Dehn, 1918.)

POTASSIUM HYDROXIDE KOH.

Freezing-Points of Aqueous Solutions of Potassium Hydroxide.
(Klein and Svanberg, 1920.)

t°.....	—0.343.	—0.875.	—1.773.
Gms. KOH per 100 cc. sol.....	0.5611	1.403	2.805

POTASSIUM FORMATE HCOOK.

Determinations of the freezing-points of aqueous solutions of potassium formate made in a Beckmann apparatus, gave the following results.

t°.....	—2.62.	—6.72.	—10.42.	—15.82.	—17.39.
Gms. HCOOK per 100 gms. sat. sol...	5.71	12.95	18.42	25.03	26.04

The solid phase was ice in all cases. (Sidgwick and Gentle, 1922.)

POTASSIUM IODATE KIO_3.

Solubility of Potassium Iodate in Aqueous Solutions of Potassium Hydroxide at 20°. (Brönsted, 1920 *a*.)

Gms. mols. per liter.		Gms. mols. per liter.		Gms. mols. per liter.		Gms. mols. per liter.	
KOH.	KIO_3.	KOH.	KIO_3.	KOH.	KIO_3.	KOH.	KIO_3.
4.71	0.0390	7.95	0.0179	11.10	0.0128	14.02	0.0154
5.06	0.0362	9.41	0.0144	12.19	0.0131	14.85	0.0194
6.35	0.0256	10.95	0.0130	12.92	0.0135		

POTASSIUM IODIDE KI.

Freezing-Points of Aqueous Solutions of Potassium Iodide. (Klein and Svanberg, 1920.)

t°	−0.350.	−0.872.	−1.721.
Gms. KI per 100 cc. solution	1.66	4.15	8.30

Solubility of Potassium Iodide in Aqueous Solutions of Potassium Hydroxide at 20°. (Brönsted, 1920 *a*.)

Gm. mols. per liter							
KOH	9.41	10.95	11.10	12.19	12.92	14.02	15.01
KI	1.72	1.23	1.176	0.933	0.824	0.672	0.558

Solubility of Potassium Iodide in Aqueous Solutions of Ethyl and of Methyl Alcohol. (Zeitlin, 1926.) See last table p. 1361.

Solvent.	Gm. mols. KI dissolved per liter at 10°.2.	Gm. mols. KI dissolved per liter at 19°.9.	Solvent.	Gm. mols. KI dissolved per liter at 10°.2.	Gm. mols. KI dissolved per liter at 19°.9.
Water	5.863	6.110	Aq. 25.96 wt.% CH_3OH.	4.169	4.308
Aq. 25.07 wt.% C_2H_5OH.	3.970	4.083	» 45.13 » »	3.089	3.25
» 50.01 » »	2.419	2.612	» 74.88 » »	1.632	1.693
» 75.03 » »	1.120	1.142	100.00 » »	0.7519	0.7350
» 97.30 » »	—	0.0428			

100 gms. glycerol of $d = 1.2326$ (= 86.5 %) dissolve 58.3 gms. KI at 20°.
» » » $d = 1.2645$ (= 98.5 %) » 50.6 » » »
(Holm, 1921, 1921 *a*, 1922.)

Distribution of Potassium Iodide at 17° Between Water and Amyl Alcohol. (Wosnessensky, 1925.)

Millimols. KI per liter of		$\frac{C_1}{C_2^{2.53}}$.
H_2O layer (C_1).	Alcohol layer (C_2).	
105.5	0.27	207
228.5	1.20	208
336.75	2.25	218
485.5	5.00	217

100 cc. sat. solution of potassium iodide in ethyl urethan contain 5.81 gms. KI at 60°. (Stuckgold, 1917.)

POTASSIUM LIGNOCERATE.

100 gms. aq. 91.53 wt. per cent ethyl alcohol dissolve 0.153 gm. potassium lignocerate at 25° and the solution has $d = 0.80935$. (Thomas and Yu, 1923.)

POTASSIUM NITRATE KNO_3.

Freezing-Points of Aqueous Solutions of Potassium Nitrate. (Klein and Svanberg, 1920.)

t°	−0.355.	−0.805.	−1.505.
Gms. KNO_3 per 100 cc. sol	1.01	2.525	6.05

Solubility of Potassium Nitrate in Aqueous Solutions of Nitric Acid at 20°. (Nichols, Howes et. al., 1919.)

Per cent HNO_3 in solvent.	Gms. KNO_3 per 100 gms. solvent.	Per cent HNO_3 in solvent.	Gms. KNO_3 per 100 gms. solvent.	Per cent HNO_3 in solvent.	Gms. KNO_3 per 100 gms. solvent.
0.0	31.4	40.0	15.2	70	29.6
10.0	19.1	50	18.6	80	34.2
20.0	14.5	60	19.6	90	48.8
30.0	11.4				

Solubility of Potassium Nitrate in Aqueous Solutions of Nitric Acid at Several Temperatures. (Kazantzev, 1923, 1925.)

Constant agitation was employed for securing saturation. One to two hours was found sufficient in all cases for the attainment of equilibrium.

Results at 0°.		Results at 15°.		Results at 30°.		Results at 75°.	
Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
HNO_3.	KNO_3.	HNO_3.	KNO_3.	HNO_3.	KNO_3.	HNO_3.	KNO_3.
0.0	11.9	0.0	20.7	0.0	31.5	0.0	60.0
1.3	11.0	7.5	14.2	5.4	25.6	5.1	53.6
4.7	8.5	18.0	10.7	11.0	20.9	17.7	41.3
8.7	7.2	23.3	10.1	18.2	17.2	21.8	38.9
13.2	6.4	24.0	10.2	27.2	15.7	29.3	37.4
16.5	6.1	29.2	10.5	40.1	18.9	32.2	36.7
25.5	6.4	40.0	13.6	47.7	27.7	38.5	37.6
30.1	7.0	45.1	17.7	49.0	33.2	42.5	39.9
33.5	7.5	49.3	25.1	50.1	39.5	45.5	43.9
39.9	9.7	51.0	32.7	50.6	42.5	46.7	50.0
48.0	16.5	51.6	38.1	49.7	49.9	46.2	52.6
50.7	23.1	51.3	44.1				
52.2	30.2	50.0	49.2				
52.2	38.2						
52.2	39.4						
50.7	48.4						
57.5	34.4	(Solid Phase = $KNO_3.2HNO_3$)					
73.0	25.5	(» »)					

Solubility of Potassium Nitrate in Aqueous Solutions of Potassium Hydroxide at 20°. (Brönsted, 1920 *a*).

Gm. mols. per liter		Gm. mols. per liter		Gm. mols. per liter	
KOH.	KNO_3.	KOH.	KNO_3.	KOH.	KNO_3.
4.71	0.847	9.41	0.364	14.02	0.241
7.90	0.455	10.95	0.298	14.85	0.232
7.95	0.450	12.19	0.271	15.02	0.233

Solubility of Potassium Nitrate in Aqueous Solutions of Potassium Sulfate and Vice Versa at Several Temperatures.
(Inouye, 1925; Massink, 1918; Hamid, 1926.)

	Gms. per 100 gms. sat. sol.				Gms. per 100 gms. sat. sol.		
t°.	KNO_3.	K_2SO_4.	Solid Phase.	t°.	KNO_3.	K_2SO_4.	Solid Phase.
25...	27.64	0.0 (I)	KNO_3	25...	5.84	8.12 (I)	K_2SO_4
25...	27.33	1.64 (I)	»	25...	4.82	8.85 (H)	»
25...	26.01	1.98 (H)	»	35...	34.76	0.0 (M)	KNO_3
25...	25.91	3.00 (I)	»	35...	32.61	1.17 (M)	»
25...	25.37	3.95 (I)	» + K_2SO_4	35...	30.76	3.42 (M)	» + K_2SO_4
25...	23.99	4.45 (H)	» »	35...	16.29	6.47 (M)	K_2SO_4
25...	14.52	5.89 (I)	K_2SO_4	35...	0.0	12.17 (M)	»
25...	11.05	6.89 (H)	»	90...	65.92	0.63 (H)	» + KNO_3

100 gms. solution simultaneously saturated with potassium nitrate and sodium nitrate contain 45.26 gms. KNO_3 + 37.57 gms. $NaNO_3$ at 90°. (Hamid, 1926.)

Data for the quarternary system $KNO_3 + K_2SO_4 + NaNO_3 + Na_2SO_4 + H_2O$ at 25° and at 90° are given by Hamid, 1926.

100 gms. aq. 50 wt. % ethyl alcohol dissolve 3.7 gms. KNO_3 at 20°. (Wright, 1926.)

Fusion-point data for mixtures of potassium nitrate and sodium nitrate are given by Briscoe and Madgin, 1923; Madgin and Briscoe, 1923, and Quartarolli, 1920.

POTASSIUM Cobalti NITRITE $K_3Co(NO_2)_6$.

Solubility of Potassium Cobalti Nitrite in Aqueous Alcohol at 14°.
(Pierrat, 1921.)

Note. — Saturation was obtained by agitation for several hours. The saturated solution was evaporated to dryness in a current of air and enough water to yield the original volume of the solution was added. The nitrite in this solution then determined by calculations from the electrolytic conductivity.

Wt. per cent C_2H_5OH in solvent.	Gms. $K_3Co(NO_2)_6$ per liter sat. sol.	Wt. per cent C_2H_5OH in solvent.	Gms. $K_3Co(NO_2)_6$ per liter sat. sol.
0.0	0.21	27.3	0.036
8.7	0.09	42.4	0.033
15.7	0.056	94.7	0.026

POTASSIUM OLEATE $C_8H_{17}CH:CH(CH_2)_7COOK$.

100 gms. of aq. 91.53 wt. per cent C_2H_5OH dissolve 41.1 gms. $C_{18}H_{33}O_2K$ at 25° and the saturated solution has $d = 0.80935$. (Thomas and Yu, 1923.)

POTASSIUM OXALATE $K_2C_2O_4.H_2O$.

Freezing-Points of Aqueous Solutions of Potassium Oxalate.
(Klein and Svanberg, 1920.)

t°	−0.446.	−1.066.	−2.088.
Gms. $K_2C_2O_4$ per 100 cc. solution	1.271	4.177	8.355

Solubility of Potassium Oxalate in Water. (Woskressenskaja, 1926.)

Saturation was secured by constant stirring for 2 to 4 hours, and repeating the determinations after stirring another 1 1/2 hours. Below 0° the determinations were made by the freezing-point method.

t°.	Gms. $K_2C_2O_4$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $K_2C_2O_4$ per 100 gms. sat. sol.	Solid Phase.
— 0.0.....	0.0	Ice	20.....	25.95 (25.89)	$K_2C_2O_4.H_2O$
— 0.6.....	2.4	»	25.....	27.40	»
— 1.4.....	5.14	»	30.....	28.70	»
— 3.0.....	10.47	»	40.....	31.2	»
— 4.0.....	14.10	»	50.....	33.5	»
— 5.05.....	17.12	»	60.....	35.6	»
— 5.75.....	18.83	»	70.....	37.8	»
— 6.34 Eutec.	20.00	»+$K_2C_2O_4.H_2O$	80.....	40.2	»
± 0.....	20.28	$K_2C_2O_4.H_2O$	90.....	42.0	»
10.....	23.20	»	100.....	44.5	»
16.....	24.81	»	107.....	45.9	»

The result in parenthesis is given by Trifonov, 1924, 1925.

Solubility of Potassium Oxalate in Aqueous Solutions of Sodium Oxalate and Vice Versa at 25°. (Rivett and O'Conner, 1919.)

d of sat. sol.	Gms. per 100 gms. sat. sol. $K_2C_2O_4$.	Gms. per 100 gms. sat. sol. $Na_2C_2O_4$.	Solid Phase.	d of sat. sol.	Gms. per 100 gms. sat. sol. $K_2C_2O_4$.	Gms. per 100 gms. sat. sol. $Na_2C_2O_4$.	Solid Phase.
1.215	27.2	0.0	$K_2C_2O_4.H_2O$	1.178	19.6	3.21	$Na_2C_2O_4$
1.218	26.8	0.77	»	1.135	14.4	3.21	»
1.223	26.3	1.71	»	1.084	8.10	3.40	»
1.226	26.2	2.17	»	1.057	3.99	3.71	»
1.228	26.1	2.50	»+$Na_2C_2O_4$	1.026	0.00	3.71	»

POTASSIUM Cobalti **OXALATES**, laevo, $K_3[Co(C_2O_4)_3].H_2O$ and racemic $K_3[Co(C_2O_4)_3]3\,1/2\,H_2O$.

SOLUBILITY OF EACH SEPARATELY IN WATER.

(Jaeger and Thomas, 1918, 1919.)

t°.	Gms. racemic salt per 100 gms. H_2O.	t°.	Gms. laevo salt per 100 gms. H_2O.
0.....	34.50	20.....	37.40
14.....	36.84	22.....	37.60

By plotting these results the transition temperature is found to be 13.2°.

POTASSIUM PERMANGANATE $KMnO_4$.

SOLUBILITY OF POTASSIUM PERMANGANATE IN WATER.

(Voerman, 1905, 1906.)

t°.	Gms. $KMnO_4$ per 100 gms. sat. sol.	Gms. $KMnO_4$ per 100 gms. water.	Solid Phase.
—0.18.....	0.58	0.58	Ice
—0.27.....	0.99	1.01	»
—0.48.....	1.98	2.02	»
—0.58 Eutec.	2.91	3.00	»+$KMnO_4$

t°.	Gms. $KMnO_4$ per 100 gms. sat. sol.	Gms. $KMnO_4$ per 100 gms. water.	Solid Phase.
+10.....	4.01	4.22	$KMnO_4$
15.....	4.95	5.20	»
25.....	7.00	7.53	»
40.....	11.09	12.47	»
50.....	14.35	16.75	»

SOLUBILITY OF POTASSIUM PERMANGANATE AT 25° IN AQUEOUS SOLUTIONS OF :

(Trimble, 1922.)

Potassium Sulfate.

$d_{\frac{25}{4}}$ of sat. sol.	Gms. per 100 gms. sat. sol. K_2SO_4.	Gms. per 100 gms. sat. sol. $KMnO_4$.	Solid Phase.
1.0454	0.0	7.10	$KMnO_4$
1.0483	0.80	6.59	»
1.0537	1.98	5.92	»
1.0730	5.47	4.52	»
1.0876	7.79	3.87	»
1.0979	9.26	3.55	»+K_2SO_4
1.0864	10.75	0.00	K_2SO_4

Sodium Sulfate.

$d_{\frac{25}{4}}$ of sat. sol.	Gms. per 100 gms. sat. sol. Na_2SO_4.	Gms. per 100 gms. sat. sol. $KMnO_4$.	Solid Phase.
1.0554	0.88	7.33	$KMnO_4$
—	4.62	7.83	»
1.1180	7.05	7.75	»
—	9.34	7.67	»
—	12.85	7.27	»
	17.05	6.68	»
1.2363	19.43	6.25	»
—	21.04	5.91	»+$Na_2SO_4.10H_2O$
1.2071	21.80	0.0	$Na_2SO_4.10H_2O$

The author also gives data for the densities of aqueous solutions of $KMnO_4$, K_2SO_4 and of Na_2SO_4. He also gives a few determinations of the solubility of $KMnO_4$ in aqueous solutions of mixtures of K_2SO_4 and Na_2SO_4.

POTASSIUM PHENOLATES, $C_6H_5OK.2H_2O$, $C_6H_5OK.3C_6H_5OH$.

EQUILIBRIUM IN THE SYSTEM POTASSIUM HYDROXIDE, PHENOL AND WATER AT 25°.

(Van Meurs, 1916.)

Mols. per 100 mols. sat. sol. C_6H_5OH.	Mols. per 100 mols. sat. sol. KOH.	Solid Phase.
70.20	0.74	C_6H_5OH
76.40	4.13	»
60.16	7.28	$C_6H_5OK.3C_6H_5OH$
51.27	8.32	»
46.38	9.11	»
33.79	11.18	»
29.70	17.13	»
31.69	19.05	»+$C_6H_5OK.2H_2O$

Mols. per 100 mols. sat. sol. C_6H_5OH.	Mols. per 100 mols. sat. sol. KOH.	Solid Phase.
25.93	17.15	$C_6H_5OK.2H_2O$
22.15	16.92	»
14.95	15.48	»
8.84	15.39	»
5.57	15.14	»
0.92	16.04	»
0.04	26.04	»
0.0	27.65	$KOH.2H_2O$

The two liquid layers which are formed at concentrations of KOH less than about 0.5 mol. % have the following compositions.

Aqueous layer. Mol. % C_6H_5OH.	Aqueous layer. Mol. % KOH.	Phenol layer. Mol. % C_6H_5OH.	Phenol layer. Mol. % KOH.
1.79	0.0	32.33	0.0
2.48	0.19	21.60	0.37
3.85	0.25	15.85	0.45

PHENOLPHTALEIN $\begin{matrix} C_6H_4 \\ | \\ CO.O \end{matrix}\!\!>\!C\!<\!\!\begin{matrix} C_6H_4OK \\ C_6H_4OH \end{matrix}$ $.5H_2O$, etc.

Equilibrium in the System Potassium Hydroxide, Phenolphthalein and Water at 25°. (Bassett and Bagnall, 1924.)

Note. — Saturation was obtained by constant rotation for not less than 3 days of mixtures of phenolphthalein and aqueous potassium hydroxide solutions of various strengths. Such concentrations were chosen that a liquid and a solid phase was obtained in all cases. Both the saturated solution and the solid phase was analyzed. No solid colored salt was obtained. The results are expressed in terms of phenolphthalein anhydride ($C_{20}H_{12}O_3$) potassium oxide (K_2O) and water.

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
K_2O.	$C_{20}H_{12}O_3$.	Solid Phase.	K_2O.	$C_{20}H_{12}O_3$.	Solid Phase.	K_2O.	$C_{20}H_{12}O$.	Solid Phase.
4.96	13.86	P	17.31	39.01	P.K_2.8	29.50	2.03	P.K_3.8
7.49	24.20	»	17.15	44.90	P.K_3.4	24.74	10.70	P.K_3.7
8.25	25.06	P.K.5	16.50	40.74	»	30.90	1.14	»
8.97	27.75	»	16.98	39.22	»	31.65	0.76	»
12.43	38.74	»	16.60	37.06	»	34.32	0.06	»
13.22	39.91	»	17.72	33.24	P.K_3.9	36.24	–	»
11.26	33.60	P.K.4	19.84	27.47	»	39.10	–	»
14.14	41.59	»	21.57	22.11	»	39.57	–	P.K_3.6
13.19	40.34	P.K.3	17.80	35.67	»	42.14	–	»
15.11	44.31	»	19.68	30.90	»	43.62	–	P.K_3.5
15.77	45.76	P.K_2.10	22.21	19.47	P.K_3.8	45.60	–	»
15.88	44.66	»	24.74	10.70	»	46.49	–	P.K_3.4
16.44	43.50	P.K_2.9	25.64	8.15	»	47.44	–	»
15.92	43.80	P.K_2.8	28.27	3.10	»	45.44	–	» + KOH.$2H_2O$
16.62	42.62	»	28.98	2.69	»			

P = Phenolphtalein; P.K.5, P.K.4, P.K.3 = Mono potassium salt :

$\begin{matrix} C_6H_4 \\ | \\ CO.O \end{matrix}\!\!>\!C\!<\!\!\begin{matrix} C_6H_4OK \\ C_6H_4OH \end{matrix}$ $.5H_2O$, $.4H_2O$ and $.3H_2O$;

P.K_2.10, P.K_2.9, P.K_2.8 = Di potassium salt :

$\begin{matrix} C_6H_4 \\ | \\ CO.O \end{matrix}\!\!>\!C\!<\!\!\begin{matrix} C_6H_4OK \\ C_6H_4OK \end{matrix}$ $.10H_2O$, $.9H_2O$ and $.8H_2O$;

P.K_3.4, P.K_3.9, .8, etc. = Tri potassium salt :

$CO_2K.C_6H_4.C.(C_6H_4OK)_2.OH.4H_2O$, $9H_2O$, $8H_2O$, etc.

Mono **POTASSIUM PHOSPHATE** KH_2PO_4.

Solubility of Mono Potassium Phosphate in Water. (Apfel, 1911.)

t°.	Mols. KH_2PO_4 per 1000 gms. sat. sol.	Gms. KH_2PO_4 per 100 gms. sat. sol.	t°.	Mols. KH_2PO_4 per 1000 gms. sat. sol.	Gms. KH_2PO_4 per 100 gms. sat. sol.
0.....	0.77	10.48	50.....	2.15	29.27
7.....	1.465	19.95	70.....	2.693	36.67
25.....	1.48	20.15	83.....	3.08	41.94

Solubility of Mono Potassium Phosphate in Aqueous Solutions of Salts at 25°. (Apfel, 1911.)

Salt.	Gms. salt per 100 gms. sat. sol.	Gms. KH_2PO_4 per 100 gms. sat. sol.	Salt.	Gms. salt per 100 gms. sat. sol.	Gms. KH_2PO_4 per 100 gms. sat. sol.
None....	0.0	20.15	KNO_3.....	5.56	16.33
K_2SO_4...	1.39	19.46	»	12.03	14.03
» ...	3.13	18.24	CH_3COOK.	4.91	17.43
» ...	6.27	17.70	» .	9.62	14.43
» ...	6.79	17.02	K_2CO_3.....	1.66 (3.22?)	23.01
» ...	6.27	16.74	»	5.74 (11.48?)	31.85

In the case of the solubility in aq. K_2CO_3 carbon dioxide is liberated and the results do not show equilibrium.

POTASSIUM PHOSPHOMOLYBDATE

Solubility of Potassium Phosphomolybdate in Aqueous Solutions of Potassium Nitrate. (Heidenhain, 1918.)

In order to avoid errors due to impurities in the phosphomolybdate, small quantities of the washed precipitate were digested for a time long enough to insure saturation, and the dissolved part determined either by evaporation and weighing or by titration. The temperature is not stated.

Gms. per 100 cc. Aq. solvent.		Gms. P_2O_5 per 100 cc. sat. sol.	Gms. per 100 cc. Aq. solvent.		Gms. P_2O_5 per 100 cc. sat. solution.
KNO_3.	HNO_3.		KNO_3.	HNO_3.	
10	0.0	1.30	10	0.0504	0.12
15	0.0	1.30	10	0.0252	0.18
20	0.0	1.30	10	0.0126	0.49
10	0.063	0.06			

POTASSIUM PHOSPHOTUNGSTATE

1000 cc. sat. solution of potassium phosphotungstate in water contain 0.135 gm. of the compound at 20°. (Moser and Ritschel, 1925.)

POTASSIUM Hydrogen PHTHALATE $KHC_8H_4O_8$.

100 gms. sat. solution of potassium hydrogen phthalate in water contain 10.23 gms. $KHC_8H_4O_4$ at 25°, 12.67 gms. at 35° and 36.12 gms. at the b. pt.
(Hendrixson, 1920.)

POTASSIUM PICRATE $C_6H_2(NO_2)_3OK$.

1000 cc. sat. solution of potassium picrate in water contain 5.06 gms. $C_6H_2(NO_2)_3OK$ at 20°. (Moser and Ritschel, 1925.)

Solubility of Potassium Picrate in Aqueous Solutions of Ethyl Alcohol, Methyl Alcohol and of Acetone at 25°. (Fischer, 1914, 1918.)

The composition of the aqueous alcohol and acetone mixtures, which served as solvents, was accurately controlled by density determinations. Saturation was secured by constant agitation in a thermostat. The saturated solution was withdrawn by means of a graduated pipet and its dissolved picrate determined by evaporation and weighing the residue, or by a method of titration. The absolute alcohol was prepared by treatment with lime and distillation.

Vol. per cent C_2H_5OH in solvent.	Gms. $C_6H_2(NO_2)_3OK$ per 100 cc. sat. sol.	Vol. per cent C_2H_5OH in solvent.	Gms. $C_6H_2(NO_2)_3OK$ per 100 cc. sat. sol.	Vol. % CH_3OH in solvent.	Gms. $C_6H_2(NO_2)_3OK$ per 100 cc. sat. sol.	Vol. % Acetone in solvent.	Gms. $C_6H_2(NO_2)_3OK$ per 100 cc. sat. sol.
0.0 (=H_2O)	0.645	55	0.598	10	0.542	10	0.726
10	0.559	60	0.574	20	0.470	20	0.876
15	0.475	65	0.546	30	0.444	30	1.140
20	0.450	70	0.485	40	0.422	40	1.155
25	0.453	75	0.410	50	0.411	50	2.106
30	0.472	80	0.326	60	0.410	60	2.615
35	0.484	85	0.227	70	0.396	70	3.090
40	0.533	90	0.174	80	0.332	80	3.340
45	0.560	95	0.100	90	0.254	90	3.084
50	0.582	100	0.184 (?)	100	0.274	100	1.080

POTASSIUM RESORCINOLATES $C_6H_4(OH)OK.2H_2O$, $C_6H_4(OK)_2.4H_2O$.

EQUILIBRIUM IN THE SYSTEM POTASSIUM HYDROXIDE, RESORCINOL AND WATER AT 30°. (Van Meurs, 1916.)

Mols. per 100 mols. sat. sol.			Mols. per 100 mols. sat. sol.		
$\frac{C_6H_4(OH)_2}{2}$ (*m*).	KOH.	Solid Phase.	$\frac{C_6H_4(OH)_2}{2}$ (*m*).	KOH.	Solid Phase.
38.81	0.0	$C_6H_4(OH)_2$ (*m*)	16.11	16.07	$C_6H_4(OK)_2.4H_2O$
46.80	3.26	»	11.58	16.44	»
57.30	6.85	»	6.68	17.71	»
69.06	10.13	»	1.45	22.71	»
50.27	16.95	$C_6H_4(OH)OK.2H_2O$	0.71	26.49	»
36.85	16.40	»	0.76	26.99	»+KOH(?)
33.00	16.63	»	0.74	29.95	» »
26.71	17.62	»	0.74	30.13	KOH(?)
25.64	17.84	»+$C_6H_4(OK)_2.4H_2O$	0.31	29.88	$KOH.H_2O$ (?)
22.40	17.44	$C_6H_4(OK)_2.4H_2O$	0.17	29.70	»
18.29	16.64	»	0.0	28.80	$KOH.H_2O$

POTASSIUM STANNATE $K_2Sn(OH)_6$ and $K_2Sn(OH)_6.2H_2O$.

SOLUBILITY OF THE ANHYDROUS AND THE HYDRATED SALT, EACH SEPARATELY, IN WATER. (Zocher, 1920.)

t°.	Gms. $K_2Sn(OH)_6$ per 100 gms. sat. sol.	Solid Phase.
28.....	50.7	$K_2Sn(OH)_6$
28.....	52.4	$K_2Sn(OH)_6.2H_2O$

POTASSIUM STEARATE $CH_3(CH_2)_{16}COOK$.

100 gms. aq. alcohol of $d_4^{25} = 0.80935$ (= 91.53 wt. % C_2H_5OH) dissolve 0.633 gm. $CH_3(CH_2)_{16}CO\,OK$ at 25°. (Thomas and Yu, 1923.)

POTASSIUM SULFATE K_2SO_4.

EQUILIBRIUM IN THE SYSTEM POTASSIUM SULFATE, SODIUM SULFATE AND WATER. (Hamid, 1926.)

Constant stirring for about 40 hrs. at 25° and 10 hrs. at 90° was employed.

	Gms. per 100 gms. sat. sol.		
t°.	Na_2SO_4.	K_2SO_4.	Solid Phase.
25.....	19.93	7.06	$Na_2SO_4.10H_2O$ + Mixed crystals of $K_3Na(SO_4)_2$ + Na_2SO_4
25.....	5.58	11.27	K_2SO_4 + $K_3Na(SO_4)_2$
90.....	27.05	8.33	Na_2SO_4 + Mixed crystals of $K_3Na(SO_4)_2$ + Na_2SO_4
90.....	9.23	14.97	K_2SO_4 + $K_3Na(SO_4)_2$

The above results at 25° are taken from Meyerhoffer and Saunders, 1899.

SOLUBILITY OF POTASSIUM SULFATE IN AQUEOUS SOLUTIONS OF ZINC SULFATE AND VICE VERSA AT 25°. (Caven and Johnston, 1926.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
K_2SO_4.	$ZnSO_4$.	Solid Phase.	K_2SO_4.	$ZnSO_4$.	Solid Phase.
10.59	0.0	K_2SO_4	2.27	33.01	$K_2SO_4.ZnSO_4.6H_2O$
10.71	1.11	»	1.93	35.58	»
10.94	1.91	»+$K_2SO_4.ZnSO_4.6H_2O$	1.82	36.00	»
6.52	4.73	$K_2SO_4.ZnSO_4.6H_2O$	1.85	36.39	»+$ZnSO_4.7H_2O$
5.99	5.40	»	1.44	36.42	$ZnSO_4.7H_2O$
3.19	25.11	»	0.0	36.61	»

Fusion-point data for mixtures of potassium sulfate and sulfuric acid are given by Kendall and Landon, 1920, and Cambi and Bozza, 1923. Results for potassium pyrosulfate and potassium bisulfate are given by Cambi and Bozza, 1923.

POTASSIUM Ethyl **SULFATE** $KC_2H_5.SO_4$ α and β forms.

SOLUBILITY OF POTASSIUM ETHYL SULFATE IN WATER. (Hammick and Mullaby, 1921.)

This compound is dimorphous. On crystallizing from methyl alcohol or water there first appear tufts of long feathery crystals which redissolve as the solution cools and give place to the ordinary foliated form. Analysis showed no difference in composition between the two forms. The temperatures were determined at which the edges of crystals, present in synthetic mixtures contained in sealed tubes, changed from rounded to sharp or vice versa. No matter at what temperature crystallization occurred the unstable β form was always the first to separate. It was easy to distinguish which solid phase was present at the different temperatures. The transition point was found to be at 51°.8. The ice curve was determined by the freezing-point method.

t°.	Gms. $KC_2H_5SO_4$ per 100 gms. sat. sol.	Solid Phase.	t° of solution for α form.	t° of solution for β form.	Gms. $KC_2H_5SO_4$ per 100 gms. sat. sol.
— 1.195	5.480	Ice	— 4.5	—13.5	49.5
— 1.142	6.37	»	— 1.9	–	51.946
— 2.130	9.434	»	+ 8.7	— 5.2	58.81
— 2.98	12.953	»	21.0	+12.1	66.6
— 3.22	13.770	»	26.0	20.1	70.015
— 4.93	19.808	»	35.0	32.0	75.29
— 6.68	25.953	»	39.9	38.2	77.99
— 9.55	33.714	»	45.5	45.0	80.084
—12.9 (eutec.)	–	» + α form	51.14	51.1	82.04
—15.2 »	–	» + β »	59.46		84.44
			65.8		85.47
			69.1		86.23
			81.3		87.94
			91.2		89.62

POTASSIUM N-Phenyl β Amino Ethyl Hydrogen **SULFATE** $C_6H_5NH.C_2H_4.O.SO_3.K$.

100 cc. sat. sol. of the above compound in water contain 23.0 gms. $C_6H_5NH.C_2H_4.OSO_3.K$ at 15°. (Saunders, 1922.)

POTASSIUM Phenyl **SULFATE**, $C_6H_5O_4SK$, etc,

SOLUBILITY OF EACH SEPARATELY IN WATER AND ALCOHOL. (Burkhardt and Lapworth, 1926.)

Compound.	Formula.	Solvent.	t°.	Gms. cmpd. per 100 gms. H_2O.
Potassium phenyl sulfate	$C_6H_5O_4SK$	Water	17	16.28
» » »	»	Alcohol	17	0.704
» *m* carboxy phenyl sulfate.	$C_7H_5O_6SK$	Water	17	3.2
» α naphthyl »	$C_{10}H_7O_4SK$	»	17	2.5
» β » »	$C_{10}H_7O_4SK.4H_2O$	»	17	1.43

POTASSIUM 10 Chloro Phenanthrene 3 or 6 **SULFONATE** $C_{14}H_{18}Cl.SO_3K.H_2O$.

100 gms. H_2O dissolve 0.248 gm. of the compound at 20°. (Sandqvist, 1917.)

POTASSIUM Naphthylamine Di**SULFONATES**, 2.6.8 and 2.5.7 $C_{10}H_5.(NH_2)(SO_3K)_2$.

POTASSIUM Acid Naphthylamine Di **SULFONATES**, 2.6.8 and 2.5.7 $C_{10}H_5(NH_2)(SO_3K)(SO_3H)$.

SOLUBILITY OF EACH SEPARATELY IN WATER AT 15°. (Braunschweig, 1922.)

Compound.	Gms. cmpd. per 100 gms. sat. sol.
2.6.8 Potassium naphthylamine Disulfonate	51.6
2.5.7 » » »	63.9
2.6.8 Acid » » »	2.47
2.5.7 » » » »	2.58

POTASSIUM SULFITE K_2SO_3.

Solubility of Potassium Sulfite in Water.

(Færster, Brosche and Norberg-Schultz, 1924.)

The determinations were made with the greatest care. Constant stirring was employed to secure saturation and an atmosphere of hydrogen to prevent oxidation.

t°.	Gms. K_2SO_3 per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. K_2SO_3 per 100 gms. sat. sol.	Solid Phase.
— 1.69.....	5.78	Ice	—30.....	51.0	K_2SO_3
— 2.71.....	9.20	»	—15.....	51.3	»
— 4.10.....	13.37	»	— 6.7.....	51.45	»
— 5.74.....	17.57	»	— 3.9.....	51.35	»
— 6.84.....	20.02	»	+ 0.1.....	51.4	»
—10.88.....	26.70	»	24.0.....	51.37	»
—14.06.....	30.6	»	30.0.....	51.76	»
—31.0.....	44.0	»	54.4.....	51.90	»
—45.5 Eutec.	51.0	» + K_2SO_3	97.2.....	52.88	»

POTASSIUM Pyro SULFITE $K_2S_2O_5$ and $K_2S_2O_5 \cdot {}^2/_3H_2O$.

Solubility in Water.

(Færster, Brosche and Norberg-Schultz, 1924.)

The numerous determinations of the authors were plotted and the following values read from the curves.

Results for $K_2S_2O_5$.

t°.	Gms. $K_2S_2O_5$ per 100 gms. sat. sol.	Solid Phase.
— 1.07.....	3.73	Ice
— 2.0.....	6.8	»
— 4.0.....	13.8	»
— 5.0.....	17.5	»
— 5.6 Eutec.	19.5	» + $K_2S_2O_5$
— 30.....	20.7	$K_2S_2O_5$
± 0.0.....	22.1	»
+ 2.0.....	22.8	»
10.0.....	26.5	»
20.0.....	30.8	»
25.0.....	32.8	»
30.0.....	34.8	»
40.0.....	39.0	»
50.0.....	42.5	»
60.0.....	46.0	»
80.0.....	51.9	»
94.0.....	55.5	»

Results for $K_2S_2O_5 \cdot {}^2/_3H_2O$.

t°.	Gms. $K_2S_2O_5$ per 100 gms. sat. sol.	Solid Phase.
— 1.0.....	4.0	Ice
— 2.0.....	7.5	»
— 4.0.....	13.5	»
— 5.0.....	16.0	»
— 6.0 Eutec.	18.0	» + $K_2S_2O_5 \cdot {}^2/_3H_2O$
— 4.0.....	19.2	$K_2S_2O_5 \cdot {}^2/_3H_2O$
— 3.0.....	19.9	»
— 2.0.....	20.5	»
± 0.0.....	21.7	»
2.0.....	22.8	»
4.0.....	24.1	»
6.0.....	25.1	»
8.0.....	26.2	»
10.0.....	27.4	»
15.0.....	30.1	»
20.0.....	33.2	»

POTASSIUM Bi TARTRATE (Mono) $(CHOH)_2COOH.COOK$ (Cream of Tartar).

Solubility of Mono Potassium Tartrate in Water.

(Paul, [at 18°, 1917] 1926.)

Note. — A weighed amount of dried tartrate was shaken with a weighed amount of water a given time in a thermostat. The undissolved salt was filtered on a Gooch crucible, dried over phosphorus pentoxide and weighed. Furthermore the content of the solution was determined by titration with standard barium hydroxide solution.

t°.	$d\frac{t°}{4}$ of sat. sol.	Gms. $KHC_4H_4O_6$ per 100 cc. sat. sol.	t°.	$d\frac{t°}{4}$ of sat. sol.	Gms. $KHC_4H_4O_6$ per 100 gms. sat. sol.
0.....	1.00145	0.2653	18.....	1.00120	0.4896
5.....	1.00224	0.2975	20.....	1.00100	0.5337 (0.5415)(1)
10.....	1.00180	0.3663	25.....	1.00079	0.6412
15.....	1.00172	0.4301 (4.8)(1)	30.....	1.00026	0.7623

(1) This result is by Pierrat, 1921; (2) This result is by Moser and Ritschel, 1925.

Solubility of Mono Potassium Tartrate in Aqueous Solutions of Various Salts and Acids at 13° to 15°. (Klapproth, 1922.)

The method used for securing saturation consisted (A), in dissolving 1.0 gram of $KH\,C_4H_4O_4$ in hot water and adding the solution to the quantity of salt or acid necessary to yield the concentration in which it was desired to determine the solubility of the tartrate. The mixture was diluted to 100 cc., shaken frequently, allowed to cool to room temperature and stand at least one day. An alternate method (B) differed from the above only in that the 1.0 gram of tartrate was added directly without previously being dissolved by warming. Thus an attempt was made to approach equilibrium from above and from below without application of continuous agitation. The results by the two methods differ so greatly that it is certain saturation was not reached. Consequently, the figures have only a qualitative interest. They show, in general, that salts with a common ion reduce the solubility and acids or salts with no common ion increase it. The solubility was found to be least in a formic acid mixture, and it was concluded that this acid could be advantageously used to precipitate mono potassium tartrate from its aqueous solutions.

Solubility of Mono Potassium Tartrate in Aqueous Solutions of Alcohol at 14°. (Pierrat, 1921.)

Saturation was obtained by agitating the mixtures for several hours. The sat. solution was evaporated to dryness in a current of air and the residue dissolved in enough water to yield the original volume of the solution. The tartrate in this was determined by electrolytic conductivity.

Wt. per cent C_2H_5OH in solvent.	Gms. $KHC_4H_4O_6$ per 100 cc. sat. sol.	Wt. per cent C_2H_5OH in solvent.	Gms $KHC_4H_4O_6$ per 100 cc. sat. sol.
0.0 (= H_2O)	4.8	42.4	0.42
8.7	2.2	58.5	0.20
15.9	1.5	94.7	0.05
27.3	0.77		

Solubility of Mono Potassium Tartrate in Aqueous Solutions of Alcohol at 18°. (Paul, 1927, 1926.) See Note, page 1376, for method used.

t°.	Gms. $KHC_4H_4O_6$ per 100 cc. sat. solution in aq. C_2H_5OH of: 5.0 gms. C_2H_5OH per 100 cc. ($d_{\frac{20}{4}} = 0.98650$)	8.0 gms. C_2H_5OH per 100 cc. ($d_{\frac{20}{4}} = 0.98155$)	10.0 gms. C_2H_5OH per 100 cc. ($d_{\frac{20}{4}} = 0.97513$)
0....	0.1746 (0.98998)	0.1375 (0.98247)	0.1248 (0.97805)
10....	0.2605 (0.98974)	0.2078 (0.98203)	0.1905 (0.97746)
18....	0.358	0.294	0.258
20....	0.3924 (0.98876)	0.3371 (0.98170)	0.3003 (0.97678)
25....	0.4747 (0.98785)	0.4045 (0.98141)	0.3662 (0.97546)
30....	0.5846 (0.98673)	0.4965 (0.98118)	0.4323 (0.97364)

The figures in parentheses show the $d_{\frac{t}{4}}$ of the saturated solutions.

The author also gives data for the p_H and the electrolytic conductivity of the saturated solutions.

POTASSIUM Sodium TARTRATE, $KNaC_4H_4O_6.3\,H_2O$ and $.4H_2O$ *r* and *d*.

Solubility of the Potassium Sodium Salt of Dextro and of Racemic Tartaric Acids in Water. (Brönsted, 1921, 1926.)

Salt of Racemic Acid.		Salt of Dextro Acid.				Salt of Mixture of *d* and *l* Acids.	
t° of Cryst.	Gms. $KNaC_4H_4O_6$ per 100 gms. H_2O.	t° of. Cryst.	Gms. $KNaC_4H_4O_6$ per 100 gms. H_2O.	t° of. Cryst.	Gms. $KNaC_4H_4O_6$ per 100 gms. H_2O.	t° of. Cryst.	Gms. $KNaC_4H_4O_6$ per 100 gms. H_2O.
−6.98...	42.7	−4.7.....	28.7	0.0...	32.0	−6.42...	39.3
−5.95...	36.5	−4.34....	26.0	9.7...	46.1	+9.7....	64.4
+9.7....	58.0	−3.38....	19.0	18.0...	62.9	29.5....	140.5
29.5....	92.3	−1.875...	10.2	29.5...	100.7		

POTASSIUM THIOCYANATE KSCN.

DISTRIBUTION OF POTASSIUM THIOCYANATE AT 17° BETWEEN WATER AND AMYL ALCOHOL. (Wosnessensky, 1925.)

Millimols. KSCN per liter of		$\frac{C_1}{C_2^{0.7}}$.	Millimols. KSCN per liter of		$\frac{C_1}{C_2^{0.7}}$.
H_2O layer (C_1).	Alcohol layer (C_2).		H_2O layer (C_1).	Alcohol layer (C_2).	
155.40	2.329	88	640.235	17.379	86
338.82	7.090	86	1075.221	31.506	86
410.753	9.333	86			

POTASSIUM DiTHIONATE $K_2S_2O_6$.

100 gms. sat. solution of potassium dithionate in water contain 2.52 gms. $K_2S_2O_6$ at 0°, 4.28 gms. at 12°, 6.23 gms. at 20° and 8.54 gms. at 30°. (de Baat, 1926.)

Fusion-point data for mixtures of potassium tungstate, K_2WO_4, and sodium tungstate, Na_2WO_4, are given by Van Liempt, 1922. Results for mixtures of potassium tungstate and tungsten trioxide, WO_3, are given by Van Liempt, 1925.

POTASSIUM URATE.

SOLUBILITY OF POTASSIUM URATE IN WATER. (Barkan, 1924.)

It was previously shown that sodium urate passes from a gelatin like colloidal form to a stable granular condition, and the author desired to learn if the potassium salt behaves likewise. Several different samples of potassium urate were prepared and used for solubility determinations. The solubility of each diminished with time of rotation. In general the diminution was from about 2.38 gms. per liter to 1.9 gms. per liter. The mean of all the determinations was :

2.13 gms. ($= 10.35 \times 10^{-3}$ gms. mols.) potassium urate per liter at 18°.

Several determinations of the solubility of the compound in the fresh colloidal form gave, as the highest value, 6.67 gms. ($= 32.4.10^{-3}$ gm. mols.) potassium urate per liter at 18°.

PRASEODYMIUM ACETATE $Pr(CH_3COO)_2.H_2O$.

100 gms. sat. solution of praseodymium acetate in water contain 21.48 gms. $Pr(CH_3COO)_2$ at 25°. Saturation was obtained by constant shaking. (Meyer and Müller, 1920.)

PRASEODYMIUM Double NITRATES.

SOLUBILITY OF EACH SEPARATELY IN WATER. (Prandtl and Ducrue, 1926.)

Saturation was obtained by constant agitation.

Salt.			Compostion.	t°.	d of sat. sol.	Gms. per 100 gms. sat. sol. P_2O_3.			Double salt.
Praseodymium	Cobalt	Nitrate.	$2Pr(NO_3)_3.3Co(NO_3)_2.24H_2O$	15	1.62	13.64	9.30	CoO	67.6
»	»	»	»	30	1.65	14.28	9.75	»	70.8
»	»	»	»	45	1.69	14.98	10.13	»	74.3
»	»	»	»	60	1.72	15.89	10.79	»	78.8
»	Magnesium	»	$2Pr(NO_3)_3.3Mg(NO_3)_2.24H_2O$	15	1.49	13.55	4.91	MgO	63.0
»	»	»	»	30	1.52	14.29	5 24	»	66.4
»	»	»	»	50	1.55	15.27	5.55	»	71.4
»	»	»	»	70	1.61	16.65	6.14	»	77.5
»	Manganese	»	$2Pr(NO_3)_3.3Mn(NO_3)_2.24H_2O$	15	1.63	14.60	9.44	MnO	71.8
»	»	»	»	30	1.68	15.42	9.75	»	75.9
»	»	»	»	45	1.72	16.24	10.40	»	79.9
»	»	»	»	60	1.79	17.43	11.15	»	85.8
»	Nickel	»	$2Pr(NO_3)_3.3Ni(NO_3)_2.24H_2O$	15	1.60	12.99	8.83	NiO	64.4
»	»	»	»	30	1.63	13.83	9.41	»	68.5
»	»	»	»	45	1.66	14.50	9.87	»	71.8
»	»	»	»	60	1.70	15.27	10.47	»	75.7
»	Zinc	»	$2Pr(NO_3)_3.3Zn(NO_3)_2.24H_2O$	15	1.63	13.22	9.87	ZnO	66.3
»	»	»	»	30	1.67	14.08	10.45	»	70.6
»	»	»	»	45	1.71	15.02	11.01	»	75.4
»	»	»	»	60	1.76	15.97	11.98	«	80.1

PRASEODYMIUM TriCHLORIDE and OXIDE $PrCl_3$, Pr_2O_3.

SOLUBILITY OF PRASEODYMIUM TRICHLORIDE AND OF PRASEODYMIUM OXIDE IN AQUEOUS SOLUTIONS OF AMMONIUM CHLORIDE AT SEVERAL TEMPERATURES.
(Prandtl and Rauchenberger, 1920; See Note Neodymium Trichloride, p. 1311.)

The basic chlorides which were obtained were as follows. At 15°, $Pr_4Cl_2O_5.9H_2O$ at 30°, $Pr_3ClO_4.6H_2O$; at 50°, $Pr_4Cl_2O_5.20H_2O$.

PRASEODYMIUM LACTATE $Pr(C_3H_5O_3)_3.2\,1/2\,H_2O$.

1000 cc. sat. solution of praseodymium lactate in water contain 24.84 gms. $Pr(C_3H_5O_3)_3.2\,1/2\,H_2O$ at 20°. Saturation was obtained by constant shaking. (Jantsch, 1926.)

PROPIONIC ACID C_2H_5COOH.

DISTRIBUTION OF PROPIONIC ACID AT 25° BETWEEN WATER AND BENZENE.
(Brown and Bury, 1923.)

Normality of C_2H_5COOH in		Normality of C_2H_5COOH in		Normality of C_2H_5COOH in	
H_2O layer.	C_6H_6 layer.	H_2O layer.	C_6H_6 layer.	H_2O layer.	C_6H_6 layer.
0.154	0.0223	0.416	0.128	1.401	1.002
0.191	0.0343	0.646	0.276	2.799	2.710
0.310	0.0778	1.060	0.644	3.562	3.556

DISTRIBUTION OF PROPIONIC ACID AT 25° BETWEEN :

Water and Chloroform. (Smith, 1921, 1922.)

Millimols. C_2H_5COOH per liter of		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
2.92	0.40	0.137
5.65	0.85	0.153
7.12	1.175	0.165
10.75	1.95	0.181

Water and Cotton Seed Oil. (Gordon and Reid, 1922.)

Gms. C_2H_5COOH per 100 gms. of		Gms. C_2H_5COOH per 100 gms. of	
H_2O layer.	C. S. oil layer.	H_2O layer.	C. S. oil layer.
3.4	0.58	36.2	9.20
7.4	1.53	59.8	14.00
14.3	3.48	62.5	15.00
23.0	6.10	67.3	17.40

DISTRIBUTION OF PROPIONIC ACID BETWEEN WATER AND ETHYL ETHER.

Results at 18°. (de Kolossowsky, 1925.)

Gm. mols. C_2H_5COOH per liter of		Gm. mols. C_2H_5COOH per liter of		Gm. mols. C_2H_5COOH per liter of	
H_2O layer.	$(C_2H_5)_2O$ layer.	H_2O layer.	$(C_2H_5)_2O$ layer.	H_2O layer.	$(C_2H_5)_2O$ layer.
0.169	0.331	0.9427	2.4408	1.862	4.138
0.324	0.676	1.143	2.857	1.9086	4.1643
0.611	1.389	1.454	3.546	1.9665	4.3089
0.857	2.143	1.6022	3.8173	2.206	4.794

Results at 21°-22°. (Behrens, 1926.)

Concentration.			Concentration.		
H_2O layer (b).	$(C_2H_5)_2O$ layer (a).	$\frac{a}{b}$.	H_2O layer (b).	$(C_2H_5)_2O$ layer (a).	$\frac{a}{b}$.
0.01503	0.02560	1.703	0.03345	0.0573	1.713
0.0218	0.03715	1.704	0.0484	0.0840	1.736
0.03085	0.0529	1.715	0.06695	0.1175	1.755
0.03270	0.0559	1.710			

Results at 25°. (Smith, 1921, 1922)

Millimols. per liter.		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.675	0.8875	1.315
0.925	1.225	1.325
2.35	3.375	1.435
5.45	8.30	1.52

DISTRIBUTION OF PROPIONIC ACID AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Xylene.

Millimols. C_2H_5COOH per liter of		
H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.
3.80	0.20	0.0528
9.20	0.60	0.065
19.30	1.30	0.067

Acetone and Glycerol.

Millimols. C_2H_5COOH per liter of			Millimols. C_2H_5COOH per liter		
Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.	Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
1.73	0.43	4.05	7.45	2.15	3.46
3.06	0.78	3.93	10.85	3.50	3.10
5.76	1.48	3.80	19.40	5.80	3.34
			31.00	9.60	3.23

α Brom **PROPIONIC ACID** CH_2BrCH_2COOH.

DISTRIBUTION BETWEEN ACETONE AND GLYCEROL AT 25°. (Smith, 1921, 1922.)

Millimols. $C_3H_5BrCOOH$ per liter of Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.	Millimols. $C_3H_5BrCOOH$ per liter of Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
1.42	0.21	6.75	6.7625	0.4875	13.9
2.62	0.30	8.73	11.20	0.70	16.0
4.50	0.40	11.2	20.65	0.90	23.0

DISTRIBUTION OF α BROM PROPIONIC ACID AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Chloroform.

Millimols. $C_3H_5BrCOOH$ per liter of H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
4.40	1.10	0.250
6.65	1.70	0.256
13.00	3.48	0.268
20.20	5.56	0.276

Water and Xylene.

Millimols. $C_3H_5BrCOOH$ per liter of H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.
6.20	0.44	0.071
8.40	0.70	0.0835
10.50	1.00	0.095
13.10	1.40	0.107

Water and Ethyl Ether.

Millimols. $C_3H_5BrCOOH$ per liter of H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.3125	1.1250	3.60
0.40875	1.68125	4.02
0.5000	2.275	4.55
0.5875	2.7875	4.75
0.700	3.450	4.93

Millimols. $C_3H_5BrCOOH$ per liter of H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.8625	4.8625	5.64
1.125	6.675	5.93
1.300	9.5000	7.30
1.725	2.275	7.11

αβ Dibrom **PROPIONIC ACID** $CH_2Br.CHBrCOOH$.

DISTRIBUTION OF αβ DIBROM PROPIONIC ACID AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Chloroform.

Millimols. $C_3H_3Br_2COOH$ per liter of H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
1.85	0.313	0.169
2.66	0.560	0.210
3.54	0.985	0.278
4.98	1.63	0.327

Water and Ether.

Millimols. $C_3H_3Br_2COOH$ per liter of H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.2187	0.8562	3.92
0.2562	1.1312	4.42
0.350	2.1000	6.00
0.450	3.2625	7.25

Water and Xylene.

Millimols. $C_3H_3Br_2COOH$ per liter of H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.
3.70	0.50	0.135
5.20	0.75	0.144
7.20	1.30	0.181
7.35	1.45	0.197

β Iodo **PROPIONIC ACID** $CH_3CHICOOH$.

DISTRIBUTION OF β IODO PROPIONIC ACID AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Chloroform.

Millimols. C_3H_5ICOOH per liter of H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
1.162	0.5375	0.462
1.61	0.805	0.500
2.80	1.541	0.552
3.70	2.12	0.572
5.55	3.50	0.630

Water and Ether.

Millimols. C_3H_5ICOOH per liter of H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.175	1.275	7.3
0.280	2.26	8.1
0.500	4.64	9.3
0.900	8.66	9.6
1.44	15.22	10.6

Water and Xylene.

Millimols C_3H_5ICOOC. per liter of H_2O layer (C_2).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.
2.97	0.525	0.1765
3.90	0.745	0.191
6.60	1.44	0.218
7.25	1.75	0.242
13.75	4.46	0.325

Phenyl Brom Oxy**PROPIONIC ACIDS** (Optically Active Isomers).

SOLUBILITY OF EACH SEPARATELY IN CHLOROFORM AT 20°.
(Berner and Riiber, 1921.)

Compound.	M. pt.	Gms. cmpd. per 100 gms. $CHCl_3$.
r β Phenyl β Brom α Oxy Propionic Acid	165°....	0.30
d » » »	143.....	1.00
l » » »	143.....	1.00
r β » β » »	157.....	0.20
d » » »	138.....	2.60
l » » »	138.....	2.60
α Modification of β Phenyl α Brom α Oxy Acid	125.....	0.30
β » » » »	126.5...	0.66
d β Phenyl α Brom α Oxy Propionic Acid	119.....	0.37
r » » »	69.....	0.51
l » » »	97.....	1.77

r = racemic; *d* = dextro; *l* = laevo.

The authors also give the melting point curves of various mixtures of the isomers.

β Phenyl**PROPIONIC ACID** $CH_3CH(C_6H_5)COOH$.

SOLUBILITY OF β PHENYL PROPIONIC ACID IN WATER AND IN BENZENE.
(Sidgwick and Ewbank, 1921 *a*.)

The determinations were made by the synthetic method and very careful attention was paid to all details necessary to insure accuracy.

Results for Water.

t°.	Gms. $CH_3CH(C_6H_5)$ .COOH per 100 gms. sat. sol.	Solid Phase.
38.5.....	94.92	Solid
34.0 tr. pt..	—	Solid + liquid layers
101.5.....	80.3	Liquid layers
143.5.....	60.16	»
150.0 crit. t.	39.31	»
149.2.....	19.31	»
119.9.....	5.0	»

Resuls for Benzene.

t°.	Gms. $CH_3CH(C_6H_5)$ .COOH per 100 gms sat. sol.	Solid Phase.
48.6....	100	$CH_3CH(C_6H_5)COOH$
28.....	78.87	»
12.8....	60.43	»
—3.1....	40.20	»
—1.8....	31.26	C_6H_6
+1.5....	19.65	»
5.5 ...	0.0	»

β Phosphono**PROPIONIC ACID** $HCOO.CH_2.PO(OH)_2$ (m. pt. = 178°).

100 gms. sat. sol. in water contain 39.7 gms. of the compd. at 0° and 48.8 gms. at 20°.
(Nylen, 1926.)

PROPYL ACETATE, BROMIDE, CHLORIDE, etc.

SOLUBILITY OF EACH SEPARATELY IN WATER. (Führer, 1924.)

The determinations were made simply by measuring from a buret the quantity of each compound just sufficient to saturated a given amount of water after thorough shaking. High accuracy is not claimed for the results.

Compound.	Formula.	t°.	Gms. cmpd. per 100 gms. sat. sol.
n Propyl Acetate.....	$CH_3COO.CH_2CH_2CH_3$	20	1.89
Iso » »	$CH_3COO(CH_3)_2CH$	20	3.09
» Butyrate.....	$C_3H_7COO.C_3H_7$	17	0.162
» Benzene.....	$CH_3(CH_2)_2.C_6H_5$	15	0.006
» Bromide.....	$CH_3CH_2CH_2Br$	19.5	0.226
Iso » »	$(CH_3)_2CHBr$	18	0.286
» Chloride.....	$CH_3CH_2CH_2Cl$	12.5	0.232
Iso » »	$(CH_3)_2CHCl$	12.5	0.342
» Iodide.....	$CH_3CH_2CH_2I$	20	0.087

PROPYL AMINE $C_3H_7.NH_2$.

DISTRIBUTION OF PROPYL AMINE BETWEEN WATER AND XYLENE AT 25°.
(Smith. 1921, 1922.)

Millimols. $C_3H_7.NH_2$ per liter of		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	Xylene layer (C_2).	
2.45	0.60	0.245
4.80	1.30	0.270
7.75	2.25	0.290

DiPROPYL AMINE $(C_3H_7)_2NH$.

DISTRIBUTION OF DIPROPYL AMINE AT 25° BETWEEN :
(Smith, 1921, 1922).

Water and Ether.			Water and Xylene.			Acetone and Glycerol.		
Millimols. $(C_3H_7)_2NH$ per liter of			Millimols. $(C_3H_7)_2NH$ per liter of			Millimols. $(C_3H_7)_2NH$ per liter of		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.	Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
0.26	1.005	3.86	0.323	1.04	3.19	1.30	0.925	1.40
0.43	1.915	4.46	0.456	1.544	3.38	1.925	1.325	1.45
0.60	2.97	4.95	0.575	2.325	4.04	3.85	1.60	2.40
0.92	5.70	6.2	0.85	4.16	4.88	5.425	2.025	2.69
1.48	9.76	6.6	1.45	8.55	5.90	8.775	2.275	3.64
			2.42	17.58	7.25	10.1	2.75	3.67

DiPROPYL AMINE Acid Phthalate.

TriPROPYL AMINE Acid Phthalate.

DISTRIBUTION OF EACH SEPARATELY AT 25° BETWEEN ACETONE AND GLYCEROL
(Smith, 1921, 1922).

See Note under dimethyl amine acid phthalate, page 1301.

Results for Dipropyl Amine Acid Phthalate			Results for Tripropyl Amine Acid Phthalate.		
Millimols. acid phthalate per liter of		$\frac{A}{G}$.	Millimols. acid phthalate per liter of		$\frac{A}{G}$.
Acetone layer (A).	Glycerol layer (G).		Acetone layer (A).	Glycerol layer (G).	
0.600	1.45	0.413	1.400	1.375	1.020
0.8875	2.50	0.335	2.125	2.55	0.843
1.35	4.525	0.298	3.125	4.45	0.702
1.825	7.625	0.239	4.25	6.80	0.625
2.45	10.90	0.224			

PROPYLENE $CH_3.CH : CH_2$.

1 cc. abs. ethyl alcohol dissolves from 12 to 13 cc. of propylene at 19°.
(Spörry, 1922, 1926.)

PYRAMIDONE Dimethyl amino antipyrine $(C_{11}H_{11}ON_2)N(CH_3)_2$.

Freezing-point data for mixtures of pyramidone and veronal are given by Rheinboldt and Kircheisen, 1925.

PYRIDINE $CH<(CH.CH)_2>N$.

DISTRIBUTION OF PYRIDINE BETWEEN WATER AND BENZENE AT 25°.
(Woodman and Corbet, 1925.)

Measured volumes of benzene, water and pyridine were placed in stoppered graduated cylinders. The mixtures were maintained at 25° for 6 hours and vigorously shaken periodically. The volume of the two layers was noted and known volumes of each weighed and the pyridine in them determined by titration with normal acid, using methyl orange as indicator. The volume of benzene was measured.

Benzene layer.			Water Layer.		
Density.	Wt. % Pyridine.	Wt. % C_6H_6.	Density.	Wt. % Pyridine.	Wt. % C_6H_6.
0.874	3.28	94.54	0.994	1.17	0.0
0.882	9.75	87.46	0.995	3.55	0.0
0.983	18.35	79.49	0.998	7.39	trace
0.903	26.99	71.31	0.997	13.46	0.15
0.909	31.42	66.46	0.997	22.78	0.25
0.911	34.32	64.48	0.996	32.15	0.44
0.915	36.85	59.35	0.997	42.47	2.38
0.918	39.45	56.43	0.990	48.87	3.99
0.914	39.27	55.72	0.991	49.82	4.28

DISTRIBUTION OF PYRIDINE AT 25° BETWEEN :

(Smith, 1921, 1922.)

Water and Chloroform. Millimols. C_5H_5N per liter of			Water and Xylene. Millimols. C_5H_5N per liter of		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.
0.225	1.225	5.4	1.00	1.90	1.90
0.30	2.2	7.3	2.05	3.80	1.85
0.55	5.10	9.3	4.80	9.50	1.98
1.45	16.25	11.2	9.75	19.00	1.95

2.4 Dimethyl **PYRIDINE** $C_5H_3(CH_3)_2N$.

RECIPROCAL SOLUBILITY OF 2.4 DIMETHYL PYRIDINE AND WATER.

(Jones and Speakman, 1921.)

The determinations were made by the Alexejeff synthetic method.

t° of lower solution point.	Wt. per cent H_2O. in mixture.	t° of lower solution point.	Wt. per cent H_2O in mixture.
>150.....	15.99	27.2.....	55.11
>150.....	23.14	23.0.....	67.96
68.5.....	30.92	23.0.....	79.57
53.0.....	37.50	35.0.....	93.00
39.0.....	45.14	54.3.....	95.06

The minimum critical solution temperature is 22.5°.

PYROCATECHOL *o* $C_6H_4(OH)_2$ see also Catechol.

Freezing-point lowering data (solubilities see foot-note, p. 1001) are given for mixtures of pyrocatechol and each of the following compounds :

Quinone (Kremann, Sutter, Sitte, Strzelba and Dobotzky, 1922.)
Resorcinol (Senden, 1923.)
Succinic acid (Kremann, Zechner and Dràzil, 1924.)
Succinimide (Kremann and Dietrich, 1923.)

PYROCATECHOL Arsenic Acid $[O:As(O.C_6H_4O)_3]H_3 + 4H_2O$.

100 gms. sat. solution in water contain 42.4 gms. of the compound at ord. temps.
» » » » alcohol » 82.7 » » » » »
(Weinland and Hemzler, 1920.)

PYROGALLOL $C_6H_3(OH)_3$, 1.2.3.

SOLUBILITY OF PYROGALLOL IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°.

(Knox and Richards, 1919.)

Equiv. Normality.		Equiv. Normality.		Equiv. Normality.	
HCl.	$C_6H_3(OH)_3$.	HCl.	$C_6H_3(OH)_3$.	HCl.	$C_6H_3(OH)_3$.
0.0	4.02	5.12	1.25	10.43	0.92
1.53	2.81	6.86	1.01	10.48	0.93
3.18	1.86	8.68	0.91		

Freezing-point lowering data are given for the following mixtures :

Pyrogallol + Quinone (Kremann, Sutter, Sitte, Strzelba and Dobotzky, 1922.)
» + Salicylaldehyde (Kremann and Zechner, 1925.)
» + Succinic acid (Kremann, Zechner and Dràzil, 1924.)
» + Succinimide (Kremann and Dietrich, 1922.)
» + *p* Toluidine (Kremann and Zechner, 1918.)

Dimethyl **PYRONE.**

100 gms. Carbon tetrachloride dissolve 1.04 gms. dimethyl pyrone at 20°.
» Chloroform » 34.37 » » » »
(Pawlewski, 1914, 1926.)

PYRUVIC ACID $CH_3.CO.CO\,OH$.

DISTRIBUTION OF PYRUVIC ACID AT 25°, BETWEEN : (Smith, 1921, 1922.)

Water and Chloroform. Millimols. $CH_3.CO.COOH$ per liter of			Water and Ether. Millimols. $CH_3.CO.COOH$ per liter of			Water and Xylene. Millimols. $CH_3.CO.COOH$ per liter of		
H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.
19.90	1.00	0.0592	3.65	0.55	0.151	19.6	0.40	0.0204
31.2	2.00	0.064	5.00	0.80	0.160	45.8	1.10	0.024
			7.05	1.15	0.163	63.7	1.85	0.029
			14.10	2.40	0.170			

QUERCETIN $C_{15}H_{10}O_7.2H_2O$ (m. pt. 310°-311°).

QUERCETRIN $C_{21}H_{20}O_{11}$ (m. pt. 174°-176°) (The yellow glucoside of Loranthus).

SOLUBILITY OF EACH SEPARATELY IN SEVERAL SOLVENTS AT 16°.
(Wester, 1921.)

The quercetin was prepared by hydrolysis of quercetrin in 3 per cent sulfuric acid.

Solvent.	Gms. per 100 gms. sat. sol. Quercetin.	Quercetrin.
Water	0.006	0.0064
Aq. 49 % alcohol	0.029	0.894
Aq 95 % alcohol	1.419	4.040
Ether (commercial)	0.211	0.006
Methyl Alcohol	1.30	8.94
Aq. 50 vol. % methyl alcohol	0.027	0.275
Ethyl Acetate	–	0.070

QUINHYDRONE $C_6H_4O_2, C_6H_4(OH)_2$.

SOLUBILITY OF DIFFERENT SAMPLES OF QUINHYDRONE IN 0.01 NORMAL HYDROCHLORIC ACID AT 18°. (Sörensen, Sörensen and Linderstrom-Lang, 1921.)

The samples were prepared by mixing alcoholic solutions of definite molecular amounts of the two constituents of the compound. The resulting precipitates were filtered, washed with alcohol and rapidly dried. The saturated solutions were prepared by constant agitation for periods of 4 to 19 hours.

Sample N°.	Mols. per liter Quinhydrone.	Hydroquinone.	Sample N°.	Mols. per liter Quinhydrone.	Hydroquinone.
UKL I....	0.01426	0.01418	CL II.....	0.01301	0.01302
UKL II...	0.01371	0.01392	CL III.....	0.01302	0.01309
CL I.....	0.01276	0.01267	CL IV.....	0.01298	0.01307
CL I*a*....	0.01297	0.01293			

QUINIDINE $C_{20}H_{24}N_2O_2.?H_2O$.

SOLUBILITY OF QUINIDINE IN WATER AT 18°. (Kolthoff, 1925.)

The first and second *dissociation constants*, as estimated by colorimetric titration curve of p_H, were found to be $K_1 = 3.7.10^{-6}$ and $K_2 = 1\ 0.10^{-10}$.

The *solubility product* of quinidine was determined by adding 0.01 *n* Na OH to 4 cc. of a 0.013 molecular quinidine sulfate solution untill a precipitate just appeared after a period of 1 day; 0.08 cc. were required and the p_H of the solution was 7.6, hence the $p_{OH} = 6.6$ and $[OH'] = 2.5.10^{-7}$. From this

$$L_{Quinidine} = [Quinidine.OH^{\cdot}]\,[OH'] = 2.5.10^{-9}.$$

Calculating from this and the first dissociation constant the solubility of quinidine in water is $6.7.10^{-4} + 0.5.10^{-4} = 7.2.10^{-4}$ gm. mols. per liter.

A saturated solution of *quinidine sulfate* in water at 18° was found to have a concentration of 0.026 gm. mol. per liter and a p_H of 5.9.

QUININE $C_{20}H_{24}N_2O_2.3\,H_2O$.

Solubility of Quinine in Water at 15°. (Kolthoff, 1925.)

The *dissociation constants* as estimated by the colorimetric titration curve, using 0.01 mol. quinine hydrochloride and 0.01 *n* Na OH, also by means of the quinhydrone electrode, were found to be $K_1 = 1\,08.10^{-6}$ and $K_2 = 2.10^{-10}$ at 15°.

The *solubility product* calculated from a precipitation experiment made by adding just enough of 0.01 *n* Na OH (1.6 to 1.8 cc.) to 5 cc. of 0.05 molecular quinine . H Cl to give a trace of opalescence, was found to be, $L_{quinine} = 4.4.10^{-9}$. From this and the K_1 dissociation constant the solubility of quinine in water was calculated to be $4.05.10^{-3}$ gms. mols. per liter. From another experiment in which 0.01 mol. quinine . H Cl was used instead of 0.05 mol., a value of 2.10^{-9}, corresponding to a solubility of $1.9.10^{-3}$ mol. per liter was found. Even this value is, however, too high according to the experiments of Mauz (Dissertation, Stuttgart) who found a saturated solution of quinine in water at 18° to have a concentration of 6.10^{-4} mol. per liter. Other experiments with quinine containing $.3\,H_2O$ of crystallization gave $6.55.10^{-4}$ mol. per liter. From these and the first dissociation constant it is evident that the *true* solubility of quinine is about 7.10^{-10} mol. per liter.

Distribution of Quinine Between Water and Ethyl Ether at 0°. (Treadwell, 1923.)

To 100 cc. of purified ether + 100 cc. of CO_2 free water, different amounts of purified quinine were added and the mixtures shaken in melting ice for one hour. After separation of the two layers 25 cc. portions of the aqueous layers were conductometrically titrated with 0.005 *n* H Cl.

Gms. Quinine per 100 cc.			Gms. Quinine per 100 cc.		
H_2O layer. C_2.	Ethereal layer. C_1.	$\frac{C_1}{\sqrt{C_2}}$.	H_2O layer. C_2.	Ethereal layer. C_1.	$\frac{C_1}{\sqrt{C_2}}$.
0.5611	0.0390	0.0520	1.1142	0.0547	0.0518
0.6274	0.0410	0.0410	1.2378	0.0577	0.0518
0.7074	0.0435	0.0517	1.2901	0.0590	0.0519
0.9013	0.0491	0.0516	1.3457	0.0603	0.0520
0.9083	0.0492	0.0517	1.4281	0.0622	0.0520
1.0018	0.0519	0.0518	1.5387	0.0647	0.0522

The observed C_1 values were plotted on a large scale diagram and the above results read by the author from the curve. The constancy of the ratio $\frac{C_1}{\sqrt{C_2}}$ shows that quinine exists in the ethereal layer in double the size molecules that it has in the H_2O layer.

100 cc. sat. solution of quinine in pure acetone contain 2.32 gms. of the alkaloid at 15°. (Harvey and Back, 1921.)

100 gms Alcohol (Abs.) dissolve 166.6 gms. Quinine at 20-25°.

100 gms. Quinoline dissolve 22.28 gms. Quinine at 20-25. (Pucher and Dehn, 1921.)

100 gms. Equimol. mixture of Alcohol and Quinoline dissolve 30.04 gms. Quinine at 20-25°. (Pucher and Dehn 1921.)

100 gms. 86.5 % Glycerol ($d = 1.2326$) dissolve 0.33 gms. Quinine at 20°.
" 98.5 " ($d = 1.2645$) " 0.96 " "
(Holm, 1921, 1922.)

Hydro QUININE

Solubility of Hydroquinine in Water at 15°. (Kolthoff, 1925.)

The *dissociation constant* was found to be $K_1 = 4.7.10^{-6}$. In determining the *solubility product* it was found that 10 cc. of 0.005 molecular hydroquinine H Cl + 0.1 cc. 0.1 *n* Na OH gave a trace of crystals. The $p_H = 8.3$ and the $p_{OH} = 5.9$. From this $L_{Hydroquinine} = 4.10^{-3} \times 1.25.10^{-6} = 5.10^{-9}$. From K_1 and L the solubility in water was calculated to be about 0.29 gm. hydroquinine per liter.

QUININE HYDROCHLORIDE $C_{20}H_{24}N_2O_2.HCl.2H_2O$.

100 cc. sat. solution of quinine hydrochloride in water contain 3.207 gms. $C_{20}H_{24}N_2O_2.HCl.2H_2O$ at 18°, 4.911 gms. at 25° and 9.242 gms. at 35°. Constant agitation was employed and the saturated solutions were analyzed by the Volhard titration method for chlorine.

(Oliveri-Mandala and Carli, 1925; Oliveri-Mandala, 1926.)

100 gms. 86.5 % Glycerol ($d = 1.2326$) dissolve 14.3 gms. Quinine hydrochloride at 20°
» 98.5 % » ($d = 1.2645$) » 16.8 » »

(Holm, 1921, 1922.)

Solubility of Quinine Hydrochloride in Aqueous Solutions of Antipyrine.
(Oliveri-Mandala and Carli, 1925.)

Constant agitation in a thermostat was employed and the saturated solutions were analyzed for chlorine by the Volhard method.

Results at 18°. Gms. per 100 cc. sat. sol.		Results at 25°. Gms. per 100 cc. sat. sol.		Results at 35°. Gms. per 100 cc. sat. sol.	
Antipyrine.	$C_{20}H_{24}N_2O_2.HCl.2H_2O$.	Antipyrine.	$C_{20}H_{24}N_2O_2.HCl.2H_2O$.	Antipyrine.	$C_{20}H_{24}N_2O_2.HCl.2H_2O$.
4.001	8.712	1.992	7.128	1.992	12.038
5.546	11.206	4.004	9.900	4.004	14.732
6.504	12.553	5.546	12.513	5.546	17.424
		6.504	14.414	6.504	19.166

Note. — There is some uncertainty in regard to the terms in which the results of Oliveri-Mandala and Carli are expressed.

QUININE GLYCERO PHOSPHATE $(OC_3H_7O_2)OPO.O(C_{20}H_{24}N_2O_2)_2 4H_2O$.

100 gms. H_2O dissolve 1.28 gms. of the anhydrous compound at 100°.

(H. Rogier, *Thèse*, Paris, 1912.)

QUININE HELIANTHATE $C_{14}H_{15}N_3SO_3.C_{20}H_{24}N_2O_2$.

1000 cc. H_2O dissolve 0.185 gm. quinine helianthate at 20-25°.

(Stark and Dehn, 1918.

QUININE Hypo **PHOSPHITE** $C_{20}H_{24}N_2O_2.H_3PO_2.2H_2O$.

100 gms. sat. solution of quinine hypophosphite in water contain 4.07 gms. $C_{20}H_{24}N_2O_2.H_3PO_2.2H_2O$ at 15°.6. (Dott, 1922.)

QUININE SULFATE $(C_{20}H_{24}N_2O_2)_2H_2SO_4.7H_2O$.

100 gms. 86.5 % Glycerol ($d = 1.2326$) dissolve 0.71 gms. Quinine sulfate at 20°
» 98.5 » ($d = 1.2645$) » 1.31 » »

(Holm, 1921, 1921 *a*, 1922.)

QUINOLINE C_9H_7N.

Distribution of Quinoline at 25° Between Water and Xylene.
(Smith, 1921, 1922.)

Millimols. C_9H_7N per liter of		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	Xylene layer (C_2).	
0.116	1.80	15.5
0.250	4.20	16.8
0.470	9.40	20.0

QUINOLINE HELIANTHATE $C_{14}H_{15}N_3SO_3.C_9H_7N$.

1000 cc. H_2O dissolve 0.854 gms. quinoline helianthate at 20-25°.

(Stark and Dehn, 1918.)

QUINONE $CO<(CH.CH)_2>CO$.

100 cc. sat. sol. of Quinone in water contain 1.37 gm. $CO<(CH.CH)_2>CO$ at 25°
» » » 0.1 *n* HCl » 1.38 » » »
» » » 1.0 *n* HCl » 1.44 » » »

(Granger and Nelson, 1921.)

Solubility of Quinone in Aqueous 0.01 *n* Hydrochloric Acid.
(Linderström-Lang, 1924; at 23°.75 Kruyt and Robinson, 1926.)

t°.	Gm. mols. $CO<(CH.CH)_2>CO$. per liter sat. sol.	Gms. $CO<(CH.CH)_2>CO$. per 100 cc. sat. sol.
11.85	0.0863	0.9333
18.0	0.1033	1.117
23.8	0.1236	1.337
23.75	0.1293	1.397

Solubility of Quinone in Aqueous Salt Solutions.

(Linderström-Lang, 1924.)

On account of the instability of quinone at lower concentrations of hydrogen ions the aqueous salt solutions were made in 0.01 *n* H Cl instead of pure water. The results, therefore, show, in all cases, the solubility of quinone in aqueous solutions containing both H Cl present in 0.01 *n* concentration, and the several salts present in the concentrations shown in the table. Constant rotation in a thermostat for 3 to 5 hours was employed. The quinone was prepared by distilling a raw quinone with water vapor. The titrations were made according to Knecht and Hibbert (*Ber.*, 43, 3455, 1910), with titanium chloride in acid solution, and retitration with iron alum, using potassium sulfocyanate as indicator.

Salt.	t°.	Gm. equiv. salt per liter.	Gm. mol. $CO<(CH.CH)_2>CO$ per liter.	Salt.	t°.	Gm. equiv. salt per liter.	Gm. mol. $CO<(CH.CH)_2>CO$ per liter.
LiCl...	11.85	0.835	0.0744	KCl.....	23.85	0.7	0.1167
» ...	»	1.670	0 0661	»	»	1.4	0.1119
» ...	»	2.505	0.0604	»	»	1.5	0.1169*
» ...	»	3.340	0.0558	»	»	2.1	0.1073
» ...	18.0	0.669	0.0908	»	»	2.8	0.1026
» ...	»	1.338	0.0818	RbCl....	18.0	0.6	0.1006
» ...	»	2.676	0.0692	»	»	1.2	0.0979
» ..	»	4.013	0.0625	»	»	2.4	0.0941
» ...	»	5.351	0.0593	CsCl	18	0.578	0.1016
» ...	23.5	0.835	0.1045	»	»	0.867	0.1019
» ...	»	1.670	0.0922	»	»	1.733	0.1002
» ...	»	2.505	0.0830	KBr.....	17.85	0.6	0.1086
» ...	»	3.340	0.0760	»	»	1.2	0.1152
NaCl...	18.85	0.4	0.0816	»	»	1.95	0 1227
» ...	»	0.8	0.0781	»	23.75	0.6	0.1277
» ...	»	1.6	0.0718	»	»	1.2	0.1342
» ...	»	3.2	0.0620	»	»	1.95	0.1408
» ...	18.0	0.49	0.0961	»	»	1.5	0.1402*
» ...	»	0.99	0.0905	KI.....	»	1.5	0.1933*
» ...	»	1.99	0.0804	$CaCl_2$ ...	17.85	0.598	0.0938
» ...	»	2.99	0.0726	» ...	»	1.195	0.0872
» ...	»	3.99	0.0661	» ...	»	2.390	0.0777
» ...	23.85	0.4	0.1152	» ...	23.75	0.598	0.1112
» ...	»	0.8	0.1092	» ...	»	1.195	0.1026
» ...	»	1.6	0.0974	» ...	«	2.390	0.0903
» ...	»	3.2	0.0821	» ...	»	3.585	0.0819
KSCN.	»	1.5	0.2200*	Na_2SO_4..	17.85	0.36	0.0870
KNO_3..	»	1.5	0.1708*	» ..	»	0.72	0.0754
K_2SO_4.	»	3.0	0.0824*	» ..	»	1.44	0.0551
KCl...	11.85	0.7	0.0839	» ..	23.75	0.36	0.1041
» ...	»	1.4	0.0826	» ..	»	0.72	0.0897
» ...	»	2.1	0.0808	» ..	»	1.44	0.0657
» ...	»	2.8	0.0792	$MgSO_4$..	18	1.0	0.0693
» ...	18.0	0.7	0.0987	» ..	»	2.0	0.0458
» ...	»	1.4	0.0956	» ..	»	3.0	0.0294
» ...	»	2.1	0.0928	$BaCl_2$ ...	18	1.5	0.0883
» ...	»	2.8	0.0894	HCl.....	»	1.49	0.1139
				H_2SO_4...	»	1.49	0.0944

* Kruyt and Robinson, 1926.

Freezing-point data for mixtures of quinone and resorcinol and for quinone and *p* toluidine are given by Kremann, Sutter, Sitte, Strzelba and Dobotzky, 1922.

2.6 Dibrom **QUINONE** Chlor**IMIDE** $O:C_6H_2Br_2:NCl$.

1000 cc. sat. solution of 2.6 dibrom quinone chlorimide in water contain 0.0002 gm. mol. or 0.06 gm. $O:C_6H_2Br_2:N\,Cl$ at 20°. (Gibbs, 1927.)

2.6 Dibrom **QUINONE OXIME** $O:C_6H_2Br:NOH$.

1000 cc. sat. solution of 2.6 dibrom quinone oxime in water contain 0.00085 gm. mol. or 0.2388 gm. $O:C_6H_2Br_2:N\,OH$ at 20°. (Gibbs, 1927 *a*.)

RADIUM EMANATIONS.

Solubility of Radium Emanations in Water. (Von Antropoff, 1919.)

A highly refined apparatus was used. The results are given in terms of the Ostwald solubility expression *l* which gives the distribution relation of the gas between the liquid and the gas phase, and in terms of the Bunsen absorption coefficient, β, as modified by Kuenen. This latter is the volume of gas, reduced to normal conditions, dissolved by unit weight of solvent. The author also gives a detailed description of the principles of gas solubility.

t°.	*l*.	β.	t°.	*l*.	β.
0.....	0.510	0.510	40.....	0.145	0.126
10.....	0.337	0.326	50.....	0.119	0.100
20.....	0.238	0.222	60.....	0.106	0.085
30.....	0.180	0.162			

Solubility of Radium Emanations in Organic Solvents. (Schulze, 1920.)

The results are given in terms of the Ostwald solubility expression *l*, which is the relation of the concentration of the gas in the liquid to that in the gas space.

Solubility of Radium Emanations, *l* in :

t°.	Toluene.	Ether.	$CHCl_3$.	Acetone.	CS_2.	$CH_3COOC_2H_5$.	C_2H_5OH.	Hexane.
−18....	27.0	29.1	28.4	10.7	50.3	13.6	11.4	35.2
−10....	22.5	–	23.8	9.3	41.5	–	–	28.5
− 5....	20.6	21.9	21.6	8.5	37.0	–	–	25.7
0....	18.4	19.9	19.6	8.0	33.4	9.41	8.28	23.4
+ 5....	17.0	18.2	18.1	7.4	–	–	–	21.4
10....	15.7	16.9	16.7	6.9	27.2	8.0	6.93	19.6
15....	13.9	15.8	15.6	6.5	–	–	–	17.9
18....	13.2	15.1	15.0	6.3	23.1	7.16	6.17	16.6
20....	–	14.8	14.6	6.1	–	–	6.03	–
25....	11.4	14.0	13.8	5.8	21.5	6.57	–	14.7
30....	10.5	13.3	13.1	5.6	20.1	–	5.30	13.3
40....	8.87	–	11.9	5.2	18.1	5.64	4.72	–
50....	7.6	–	11.2	–	–	5.22	4.26	–
60....	6.42	–	–	–	–	4.9	–	–

The solubility *l* in aniline is 4.43 at 0° and 3.8 at 18°.

The solubility *l* in benzene is 12.82 at 18°.

The author also quotes data for the densities of the solvents at the several temperatures.

RADIUM SULFATE $RaSO_4$.

Solubility in Water and in Aqueous Solutions of Sulfuric Acid at 25°. (Lind, Underwood and Whittemore, 1918.)

Constant agitation was employed and equilibrium was approached from above and from below. The dissolved radium sulfate was determined by the « emanation » method.

Conc. of H_2SO_4.	Gm.×10⁻⁸ $RaSO_4$ per 25 cc. sat. sol.	Conc. of H_2SO_4.	Gm.×10⁻⁸ $RaSO_4$ per 25 cc. sat. sol.	Conc. of H_2SO_4.	Gm.×10⁻⁸ $RaSO_4$ per 25 cc. sat. sol.
0.0 (= H_2O)	2.1	10 Per cent	2.4	50 Per cent	2.1
0.01 normal	2.0 (3.0 at 35°)	15 »	2.4	55 »	3.4
0.10 »	2.2	25 »	2.3 (3.3 at 35° and 5.0 at 45°)	60 »	6.3
1.0 »	2.2	30 »	2.3	65 »	6.4
		45 »	1.9	70 »	>79.0 (not. sat).

RAFFINOSE $C_{18}H_{32}O_{14} + 5H_2O$.

SOLUBILITY OF RAFFINOSE IN MIXTURES OF WATER AND PYRIDINE AT 25°. (Pucher and Dehn, 1921.)

A high degree of accuracy is not claimed for the results. Constant agitation was evidently not employed to insure saturation. The solutions were analyzed by evaporation and weighing the residue.

Per cent C_5H_5N in solvent.	Gms. Raffinose per 100 gms. solvent.	Per cent C_5H_5N in solvent.	Gms. Raffinose per 100 gms. solvent.	Per cent C_5H_5N in solvent.	Gms. Raffinose per 100 gms. solvent.
0.0 (=H_2O)	29.83	60	6.51	92	24.7
10.0	23.12	70	5.32	94	36.9
20	22.16	80	7.40	96	41.9
50	18.88	81.4	4.49	98	45.7
40	13.42	90	24.50	160	79.08
50	9.94	91	24.6		

100 gms. abs. alcohol dissolve 3.6 gms. raffinose at 20-25°.

100 gms. equi. molecular mixture of alcohol and quinoline dissolve 5.04 gms. raffinose at 20-25°. (Pucher and Dehn, 1921.)

RESORCINOL *m* $C_6H_4(OH)_2$.

SOLUBILITY OF RESORCINOL IN WATER AND IN ETHYL ALCOHOL. (Speyers, 1902.)

See Note under acenaphthene, page 1001.

Results for Water.

t°.	*d* of sat. sol.	Gms. $C_6H_4(OH)_2$ (*m*) per 100 gms. H_2O.
0.....	1.101	66.2
10.....	1.118	93.5
20.....	1.134	123
25.....	1.142	143
30.....	1.148	166
40.....	1.157	225
50.....	1.165	300
60.....	1.172	390
70.....	1.176	495
80.....	1.179	634

Results for Alcohol.

t°.	*d* of sat. sol.	Gms. $C_6H_4(OH)_2$ (*m*) per 100 gms. H_2O.
0.....	1.033	125
10.....	1.036	141
20.....	1.041	155
25.....	1.045	162
30.....	1.048	170
40.....	1.056	186
50.....	1.065	206
60.....	1.075	235
70.....	1.087	300
73.....	1.092	330

SOLUBILITY OF RESORCINOL IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID AT 25°. (Knox and Richards, 1919.)

Saturation was obtained by constant shaking in a thermostat for several days.

Equiv. Normality.		Equiv. Normality.		Equiv. Normality.	
HCl.	$C_6H_4(OH)_2$.	HCl.	$C_6H_4(OH)_2$.	HCl.	$C_6H_4(OH)_2$.
0.0	6.515	4.402	2.307	9.610	1.118
0.656	5.705	6.076	1.616	11.31	1.389
1.671	4.570	7.567	1.287		
3.410	3.020	9.157	1.125		

SOLUBILITY OF RESORCINOL IN ACETIC ACID IN NITROBENZENE AND IN URETHAN. (Mortimer, 1923.)

	In Acetic Acid.		In Nitrobenzene.		In Urethan.	
t°.	Mols. $C_6H_4(OH)_2$ per 100 mols. sat. sol.	Gms. $C_6H_4(OH)_2$ per 100 gms. CH_3COOH.	Mols. $C_6H_4(OH)_2$ per 100 mols. sat. sol.	Gms. $C_6H_4(OH)_2$ per 100 gms. $C_6H_5NO_2$.	Mols. $C_6H_4(OH)_2$ per 100 mols. sat. sol.	Gms. $C_6H_4(OH)_2$ per 100 gms. $NH_2CO_2C_2H_5$.
20.....	17.6	39.13	6.6	6.33	—	—
40.....	27.2	69.45	16.0	17.02	46.8	108 6
60.....	39.4	119.1	32.2	42.45	56.3	159 0
80.....	56.3	236.0	55.3	110.6	68.2	264.7
100.....	81.0	780.9	83.3	445.8	85.5	727.8

100 gms. abs. alcohol dissolve about 236 gms. $C_6H_4(OH)_2$ (*m*) at 20-25°.

100 gms. equi. mol. mixture of alcohol and quinoline dissolve about 99.8 gms. $C_6H_4(OH)_2$ (*m*) at 20-25°. (Pucher and Dehn, 1921.)

Freezing-point data for mixtures of resorcinol and succinine acid are given by Kremann, Zechner and Drâzil, 1924; results for mixtures of resorcinol and succinimide are given by Kremann and Dietrich, 1923.

Trinitro RESORCINOL $(NO_2)_3C_6H(OH)_2$

100 gms. glycol diacetate dissolve about 13.0 gms. trinitro resorcinol at 20-25°. (Taylor and Rinkenbach, 1926.)

RESORCYLIC ACID (Resorcinilic Acid).

Distribution of Resorcinilic Acid at 25° Between : (Smith, 1921, 1922)

Water and Ether. Millimols. per liter of			Water and Xylene. Millimols. per liter of		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.
0.1350	1.5950	11.81	19.2	0.50	0.0260
0.2812	4.5187	16.00	26.8	0.80	0.0298
0.3875	8.7125	22.50	40.5	1.50	0.037
0.50	12.75	25.50			

Note. — The author describes the compound here studied as resorcinilic acid and gives no information which would permit its more accurate identification.

RETENE $C_{18}H_{18}$.

Freezing-point data are given for mixtures of retene and styphnic acid by Efremov, 1919 *a*, and for mixtures of retene and 2.4.6 trinitro toluene by Efremov, 1919.

RICININE $C_8H_8N_2O_2$.

Solubility of Ricinine in Several Solvents. (Winterstein, Keller and Weinhagen, 1917.)

Solvent.	Gms. Ricinine dissolved per 100 cc. sat. sol. cold.	hot.
Water	0.345	10.35
95 % alcohol	0.345	4.67
Chloroform	0.755	–
Benzene	0.030	0.16
Pyridine	2.050 (10 gms. at 24°)	34.00 (at 115°-116°)
Methyl acetate	–	1.22

RICINOLEIC ACID $C_7H_6N_2O_2$ (m. pt. 295°).

100 gms. H_2O dissolve 0.072 gm. $C_7H_6N_2O_2$ at 18° and 0.87 gm. at 100°. (Winterstein, Keller and Weinhagen, 1917.)

RUBIDIUM ACETATE $CH_3COO\,Rb$.

Solubility of Rubidium Acetate in Water. (Sidgwick and Gentle, 1922.)

t°.	Gms. $CH_3COO\,Rb$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $CH_3COO\,Rb$ per 100 gms. sat. sol.	Solid Phase.
— 2.79	9.59	Ice	— 9.5	82.92	$CH_3COO\,Rb$
— 5.27	16.11	»	+44.7	86.23	»
— 6.82	19.64	»	99.4	89.30	»
—10.27	25.57	»	125.2	91.35	»
			246.0 m. pt.	100.00	»

RUBIDIUM BENZOATE C_6H_5COORb.

SOLUBILITY OF RUBIDIUM BENZOATE IN WATER. (Sidgwick and Ewbank, 1922.)

t°.	Gms. C_6H_5COORb per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. C_6H_5COORb per 100 gms. sat. sol.	Solid Phase.
— 1.56.....	9.41	Ice	+15.0.....	56.06	C_6H_5COORb
— 4.71.....	21.15	»	51.5.....	59.70	»
— 9.04.....	33.32	»	82.0.....	63.23	»
—14.75.....	45.75	»	147.0.....	70.32	»

RUBIDIUM HydroxyBENZOATES *o*, *m* and *p* $C_6H_4OH.COORb$.

SOLUBILITY OF EACH SEPARATELY IN WATER. (Sidgwick and Ewbank, 1922.)

Results for Rubidium Ortho Hydroxy Benzoate (= Rb Salicylate).

t°.	Gms. (*o*) $C_6H_4OHCOORb$ per 100 gms. sat. sol	Solid Phase.	t°.	Gms. (*o*) $C_6H_4OH.COORb$ per 100 gms. sat. sol.	Solid Phase.
— 1.62...	12.34	Ice	21.5...	68.15	(*o*) $C_6H_4OH.COORb.H_2O$
— 3.69...	23.48	»	27.0...	69.84	»
— 6.34...	33.81	»	49.0...	74.97	(*o*) $C_6H_4OH.COORb$
— 8.82...	42.77	»	73.0...	77.96	»
—13.17...	53.40	»	88.0...	79.89	»
+ 8.0....	64.85	(*o*) $C_6H_4OHCOORb.H_2O$	134.0...	86.36	»

Results for Rubidium Meta Hydroxy Benzoate.

t°.	Gms. (*m*) $C_6H_4OHCOORb$ per 100 gms. sat. sol.	Solid Phase.
— 2.23	14.92	Ice
— 6.41	32.13	»
—13.69	48.88	»+(*m*) $C_6H_4OHCOORb.H_2O$
+14.0	50.61	(*m*) $C_6H_4OHCOORb.H_2O$
32.5	54.94	»
45.0	60.02	»
64.0	65.04	(*m*) $C_6H_4OH.COORb$
88.0	70.45	»
105.0	74.49	»
130.0	79.91	»

Results for Rubidium Para Hydroxy Benzoate.

t°.	Gms. (*p*) $C_6H_4OH.COORb$ per 100 gms. sat. sol.	Solid Phase.
— 1.17	9.92	Ice
— 2.47	17.47	»
— 4.22	26.22	»
+17.5	35.66	(*p*) $C_6H_4OHCOORb.H_2O$
45.0	45.95	»
68.0	55.73	»
94.0	64.95	(*p*) $C_6H_4OH.COORb$
120.5	74.00	»
127.0	75.92	»

RUBIDIUM BROMATE $RbBrO_3$.

100 gms. H_2O dissolve 2.93 gms. $RbBrO_3$ at 25°, 3.55 gms. at 30°, 4.28 gms. at 35° and 5.08 gms. at 40°. (Buell and Mc Crosky, 1921.)

RUBIDIUM BROMIDE RbBr.

100 cc. sat. solution of rubidium bromide in ethyl urethan contain 0.566 gm. Rb Br at 60°. (Stuckgold, 1917.)

RUBIDIUM PerCHLORATE $RbClO_4$.

SOLUBILITY OF RUBIDIUM PERCHLORATE IN SEVERAL SOLVENTS, AT 25°.
(Willard and Smith, 1923.)

Solvent.	d_4^{25} of sat. sol.	Gms. $RbClO_4$ per 100 gms. sat. sol.	Solvent.	d_4^{25} of sat. sol.	Gms. $RbClO_4$ per 100 gms. sat. sol.
Water.....	1.0060	1.320	*n* Butyl alcohol...	0.8059	0.002
Methyl alcohol...	0.7875	0.060	*iso* »	0.7982	0.004
Ethyl alcohol....	0.7851	0.009	Acetone.....	0.7865	0.095
n Propyl alcohol..	0.7989	0.006	Ethyl acetate.....	0.8945	0.0016

100 cc. sat. solution of rubidium perchlorate in water contain 1.004 gm. $RbClO_4$ at 20°. (Moser and Ritchel, 1925.)

Solubility of Rubidium Perchlorate in Mixtures of Ethyl Acetate and Alcohols at 25°. (Smith, 1925.)

Composition of solvent.					Gms. $RbClO_4$ per 100 gms sat. sol.
90 vol. %	$CH_3COOC_2H_5$	+ 10 vol. %	CH_3OH		0.24
80 »	»	+ 20 »	»		0.43
90 »	»	+ 10 »	C_2H_5OH		0.16
80 »	»	+ 20 »	»		0.10
80 »	»	+ 20 »	93 % Alcohol		0.27
90 »	»	+ 10 »	*n* Butyl Alcohol		0.11
80 »	»	+ 20 »	»		0.13

RUBIDIUM CHLORIDE Rb Cl.

100 gms. sat. solution of rubidium chloride in selenium oxychloride ($SeOCl_2$), contain 3.56 gms. Rb Cl at 25°. (Wise, 1922.)

RUBIDIUM CHLOROPLATINATE Rb_2PtCl_6.

Solubility of Rubidium Chloroplatinate in Water.
(Archibald and Hallett, 1925.)

Saturation obtained by constant agitation for long periods. A weighed amount of the salt was agitated with 100 gms. H_2O and the undissolved portion was determined and the amount dissolved estimated by difference.

t°.	Gms. Rb_2PtCl_6 per 100 gms. H_2O.	t°.	Gms. Rb_2PtCl_6 per 100 gms. H_2O.	t°.	Gms Rb_2PtCl_6 per 100 gms. H_2O.
0.....	0.0137	40.....	0.0565	80.....	0.1824
10.....	0.0200	50.....	0.0737	90.....	0.2472
20.....	0.0283	60.....	0.0997	100.....	0.3340
30.....	0.0397	70.....	0.1324		

RUBIDIUM FORMATE HCOORb.$^1/_2H_2O$.

Solubility of Rubidium Formate in Water. (Sidgwick and Gentle, 1922.)

t°.	Gms. HCOORb per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. HCOORb per 100 gms. sat. sol.	Solid Phase.
− 1.82.	6.23	Ice	16.3.....	84.61	$HCOORb.H_2O$
− 5.62.	15.93	»	16.5 tr. pt..	—	» +$HCOORb.^1/_2H_2O$
− 7.82.	20.62	»	28.3.....	83.60	$HCOORb.^1/_2H_2O$
−10.62.	25.79	»	43.6.....	87.77	»
−13.88.	30.62	»	49.9.....	89.23	»
+ 3.3..	78.86	$HCOORb.H_2O$	46.9.....	80.23 (unstable)	»
7.8..	80.71	»	51.0 tr. pt..	—	» +HCOORb
9.5..	81.37	»	60.8.....	90.06	HCOORb
14.0..	83.59	»	101.7.....	93.89	»
			170.0 m. pt..	100.0	»

RUBIDIUM IODIDE RbI

100 cc. sat. solution of rubidium iodide in ethyl urethan contain 4.079 gms. Rb I at 60°. (Stuckgold, 1917.)

RUBIDIUM SALTS

Solubility of Each Separately in Water at 20°.
(Moser and Ritschel, 1925.)

Salt.	Formula.	Gms. salt. per 1000 cc. sat. sol.
Rubidium Silico Molybdate	—	4.1
Rubidium Picrate	$C_6H_2(NO_2)_3ORb$	3.8
Rubidium Phosphotungstate.	—	0.075
Rubidium Bitartrate	$RbHC_4H_4O_6$	8.52

SACCHARIN [2 (1)-Benzisosulfonazalone] $C_6H_4\begin{matrix}SO_2\\CO\end{matrix}NH$.

Solubility of Saccharin in Mixtures of Alcohol and Quinoline at 20-25°. (Pucher and Dehn, 1921.)

Per cent quinoline in solvent.....	0.0 (=C_2H_5OH)	10.0	23.2	55.0	70.0	80.0	90.0	100.0
Gms. saccharin per 100 gms. solvent.	2.0	2.5	3.3	6.0	7.01	8.05	8.8	10.1

SALICYLIC ACID $C_6H_4OH.COOH$ (*o*).

Equilibrium in the System Salicylic Acid and Water. (Bailey, 1925.)

The author obtained the following results which agree with those of Walker and Wood, 1898, up to 30° and are slightly higher, above this temperature. He points out that the determinations of Savorro, 1914, are probably too high. His values for the metastable region differ slightly from those of Flaschner and Rankin, 1910.

t°.	Gms. $C_6H_4OH.COOH$ per 100 gms. sat. sol.
10.....	0.131
20.....	0.184
30.....	0.261
40.....	0.395
50.....	0.592
60.....	0.864

Results for the Metastable Region.

t°.	Gms. $C_6H_4OH.COOH$ per 100 gms. H_2O layer.	Salicylic acid layer.
60.....	4.4	69.6
70.....	6.5	64.6
80.....	9.8	55.9
85.....	15.0	46.0
87.....	30.0	30.0

One liter of sat. solution of salicylic acid in water contains 1.71 gms., in 0.1 molar H_3BO_3 solution, 2.42 gms. and in 0.5 molar H_3BO_3 solution, 4.21 gms. OHC_6H_4COOH at 18°. (Kolthoff, 1926.)

Solubility of Salicylic Acid in Aqueous Solutions of Hydrochloric Acid at 25°.

Results of Knox and Richards, 1919.

Equiv. normality HCl.	Equiv. normality $C_6H_4OHCOOH$.
0.000	0.01613
1.439	0.00982
3.057	0.00822
4.374	0.00715
6.164	0.00654
7.311	0.00656
8.738	0.00666
10.20	0.00710
11.50	0.00794
12.20	0.00856

Results of Kendall and Andrews, 1921.

Equiv. normality HCl.	Equiv. normality $C_6H_4OHCOOH$.
0.000	0.0162
0.500	0.0112
1.180	0.0101
1.848	0.00912
2.498	0.00834
3.308	0.00777
4.410	0.00732
7.172	0.00692
9.522	0.00721
11.73	0.00768

Solubility of Salicylic Acid in Aqueous Solutions of Nitric Acid at 25°. (Kendall and Andrews, 1921.)

Normality of HNO_3.	Normality of $C_6H_4OHCOOH$.
0.0109	0.0149
0.0420	0.0140
0.0807	0.0139

Distribution of Salicylic Acid at 25° Between: (Smith, 1921, 1922.)

Water and Chloroform.

Millimols. $C_6H_4OHCOOH$ per liter of H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.575	0.625	1.09
0.850	1.180	1.39
1.138	1.862	1.64
1.425	2.625	1.84
2.625	6.575	2.50

Water and Ethyl Ether.

Millimols. $C_6H_4OHCOOH$ per liter of H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.0666	1.3975	21.0
0.0850	2.415	28.4
0.125	3.855	30.8
0.195	7.645	39.2
0.295	14.825	50.3

Water and Xylene.

Millimols. $C_6H_4OHCOOH$ per liter of H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.
1.038	0.550	0.530
1.350	0.862	0.638
1.785	1.238	0.692
3.075	3.075	1.000
4.675	5.675	1.215

Distribution of Salicylic Acid Between Water and Phenol at 25°. (Bailey, 1925.)

Gms. $C_6H_4OHCOOH$ per liter of						
Aqueous layer.....	0.38	1.27	2.07	4.57	5.28
Phenol layer.....	5.36	19.07	32.93	77.72	93.34

The concentration in the aqueous layer was corrected for ionization.

Distribution of Salicylic Acid at 25° Between Benzene and Aqueous Solutions of Potassium Chloride. (De Szyszkowski, 1914.)

Normality of Aq. KCl.	Gm. mols. $C_6H_5OH\,COOH$ per 1000 gms. C_6H_6 layer.	Gm. mols. $C_6H_5OH\,COOH$ per 1000 gms. Aq. KCl layer.
0.1...	$3.999.10^{-3}$	$3.596.10^{-3}$
0.1...	6.46 »	3.794 »
0.1...	10.68 »	5.252 »
0.1...	23.00 »	8.489 »
0.1...	44.20 »	12.29 »
0.1...	62.70 »	15.20 »
0.1...	72.44 »	16.34 »
0.25..	4.871 »	3.004 »
0.25..	7.12 »	3.896 »
0.25..	11.62 »	5.343 »
0.25..	25.09 »	8.57 »
0.25..	41.78 »	11.63 »
0.25..	62.80 »	14.76 »
0.5...	$4.728.10^{-3}$	$2.744.10^{-3}$
0.5 ..	7.466 »	3.837 »
0.5...	11.77 »	5.171 »
0.5...	27.96 »	8.702 »
0.5...	41.16 »	10.76 »
0.5...	56.01 »	12.93 »
0.75..	3.995 »	2.529 »
0.75..	6.572 »	3.504 »
0.75..	10.03 »	4.430 »
0.75..	21.09 »	7.021 »
0.75..	38.32 »	9.995 »
0.75..	56.59 »	12.45 »
1.0...	4.095 »	2.461 »
1.0...	29.30 »	7.818 »
1.0...	72.02 »	13.12 »

	Gm. mols. $C_6H_5OH\,COOH$ at 25°.
1000 gms. Benzene in contact with aq. 0.1 *n* KCl contain...	$7.274.10^{-2}$
» » » 1.0 *n* KCl » ...	7.202 »
» » » a large excess of H_2O » ...	7.370 »
» » previously sat. with H_2O « ...	6.321 »
« dry Benzene contain.....	5.616 »

The mixtures were shaken in a thermostat for 3 to 7 days. (De Szyszkowski, 1914.

Solubility of Salicylic Acid in Benzene at 30°.5 as Influenced by Small Amounts of Water.

(Cohen and van Dobbenburgh, 1925; Cohen and Miyake, 1926.)

A special apparatus was devised and determinations of the highest accuracy were made.

Wt. % H_2O contained in C_6H_6 used.	Gms. $C_6H_5OH\,COOH$ per 100 gms. sat. sol.	Wt. % H_2O contained in C_6H_6 used.	Gms. $C_6H_5OH\,COOH$ per 100 gms. sat. sol.
None (= dry C_6H_6).	1.001 to 1.021	0.1042.....	1.309
0.0040.....	1.015	0.1478.....	1.348
0.0147.....	1.050	0.2171.....	1.351
0.0374.....	1.095	0.3130.....	1.352
0.0682.....	1.190	Excess H_2O...	1.356

Solubility of Salicylic Acid in Carbon Tetrachloride and in Chloroform at 30°.5 as Influenced by Very Small Amounts of Water.

(Cohen and Miyake, 1926.)

Equilibrium was approached from above and below, by constant agitation of the mixtures in sealed flasks.

Carbon Tetrachloride.		Chloroform.	
Wt. % H_2O in CCl_4 used.	Gms. $C_6H_5OH\,COOH$ per 100 gms. sat. sol.	Wt. % H_2O in $CHCl_3$ used.	Gms. $C_6H_5OH\,COOH$ per 100 gms. sat. sol.
None (= dry CCl_4).	0.35–0.36	None (= dry $CHCl_3$)	1.55–1.56
0.0087.....	0.35–0.37	0.0354.....	1.63–1.64
0.0227.....	0.36	0.0608.....	1.68–1.69
0.0659.....	0.36–0.37	0.1081.....	1.71–1.82
Excess H_2O.....	0.36	Excess H_2O.....	1.72–1.73

1000 gms. Carbon tetrachloride sat. with H_2O contain 0.01902 gm. mols. $C_6H_4OH\,COOH$ at 25°.

1000 gms, Chloroform sat. with H_2O contain 0.1338 gm. mols. $C_6H_4OH\,COOH$ at 25°.

(De Szyszkowski, 1914.)

100 gms. 86.5 % Glycerol ($d = 1.2326$) dissolve 0.97 gm. $C_6H_4OH.COOH$ at 20°.
» 98.5 » ($d = 1.2645$) » 1.62 » »
(Holm, 1921, 1921 *a*, 1922.

100 gms. Cymene (b. pt. 176°-176°.5) dissolve 0.975 gm. $C_6H_4OH.COOH$ at 25°.
(Wheeler, 1920.)

SOLUBILITY OF SALICYLIC ACID IN SEVERAL OILS AT 23°.
(Verkade, 1921.)

Very carefully refined fatty oils were used.

Oil.	Gms. $C_6H_4OH.COOH$ per 100 gms. oil.	Oil.	Gms. $C_6H_4OH.COOH$ per 100 gms. oil.
Olive oil.....	2.43 (2.59)	Cocoanut oil.....	3.18
Cotton seed oil.....	2.55	Linseed oil.....	3.42
Peanut oil I.....	2.82	Castor oil.....	14.81
» II.....	2.39		

The result in parentheses is by Watermann

Freezing-point data for mixtures of salicylic acid and *p* toluidine and salicylic acid and urea are given by Kremann and Zechner, 1925.

Acetyl SALICYLIC ACID (Aspirin) $CH_3COO.C_6H_4COOH$, 1.2.

100 gms. 86.5 % Glycerol ($d = 1.2326$) dissolve 0.71 gm. $CH_3COO.C_6H_4COOH$ at 20°
» 98.5 » ($d = 1.2645$) » 0.88 » » »
(Holm, 1921, 1922.)

DISTRIBUTION OF ACETYL SALICYLIC ACID AT 25° BETWEEN :
(Smith, 1921, 1922.)

Water and Ethyl Ether.

Millimols. $CH_3COO.C_6H_4COOH$ per liter of		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2)	
0.205	0.96	4.70
0.31	1.57	5.06
0.49	2.75	5.62
0.84	5.16	6.15
1.32	8.84	6.70

Water and Xylene.

Millimols. $CH_3COO.C_6H_4COOH$ per liter of		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	Xylene layer (C_2).	
3.28	0.719	0.219
3.85	0.875	0.227
7.15	2.00	0.280
14.62	5.38	0.368
17.30	7.25	0.419

Diiodo SALYCILIC ACID $I_2(3,5)C_6H_2COOH(1)OH(2)$.

One liter of water dissolves 0.166 gm. of the compound at 10° and 0.192 gm. at 25°. (Cofman, 1920.)

Nitro SALICYLIC ACID $NO_2(5)C_6H_3COOH(1)OH(2).H_2O$.

SOLUBILITY OF 5.NITRO SALICYLIC ACID IN WATER.
(Chattaway and Curjel, 1926.)

Constant agitation in a thermostat was employed. The saturated solutions were analyzed by titration with 0.01 *n* Na OH.

t°.	Gms. $NO_2C_6H_3.OH.COOH$ per 100 gms H_2O.	Solid Phase.
14.95...	0.061	$NO_2.C_6H_3OH.COOH.H_2O$
17.5....	0.064	»
20.5....	0.068	»
25.0....	0.078	»
29.0....	0.093	»
31.0....	0.103	»
33.0....	0.115	»
35.0....	0.125	»
36.6....	0.139	»

t°.	Gms. $NO_2C_6H_3.OH.COOH$ per 100 gms. H_2O.	Solid Phase.
40.1...	0.169	$NO_2.C_6H_3OH.COOH.H_2O$
45.0...	0.200	$NO_2.C_6H_3OH.COOH$
50.1...	0.228	»
55.2...	0.273	»
60.0...	0.325	»
65.0...	0.391	»
72.0...	0.501	»
74.1...	0.528	»
99.5...	1.505	»

The transition temperature is 42°.5.

SALIPYRINE $C_{11}H_{12}N_2O.C_6H_4.OH.COOH$.

Solubility of Salipyrine in Aqueous Solutions of Antipyrine and of Sodium Salicylate at 18°. (Kolthoff, 1927.)

The determinations were made by electrolytic conductivity measurements. At 18° the conductivity of the saturated solution of salipyrine in water was 1.00×10^{-3} rec. ohms. The p_H of the solution was 2.6 and the calculated $[H^+] = 2.5 \times 10^{-3}$.

In Aq. $C_{11}H_{12}N_2O$. Gm. mols. per liter.	
$C_{11}H_{12}N_2O$.	Salipyrine.
0.0 (H_2O)	0.0132
0.025	0.00712
0.05	0.00520
0.10	0.00432

In Aq. $C_6H_4OHCOONa$. Gm. mols. per liter.	
$C_6H_4OHCOONa$.	Salipyrine.
0.05	0.0114
0.10	0.0122
0.20	0.0126

SAMARIUM ACETATE $Sa(CH_3COO)_3.3H_2O$.

100 gms. sat. solution of samarium acetate in water contain 13.05 gm. $Sa(CH_3COO)_3$ at 25°. (Meyer and Muller, 1920.)

SAMARIUM CHLORIDE $SaCl_3.6H_2O$.

Solubility in Water and in Aqueous Hydrochloric Acid. (Williams, Fogg and James, 1925.)

Saturation was secured by constant rotation for 9 hours or more and approaching equilibrium from above and from below. Approximately 1.0 cc. quantities of the saturated solutions were diluted to about 150 cc. and precipitated with oxalic acid. The precipitate was filtered and the residue ignited and weighed.

Results for Water.			Results for Aq. HCl of $d = 1.1051$.		
t°.	Gms. $SaCl_3$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $SaCl_3$ per 100 gms. sat. sol.	Solid Phase.
10.....	48.02	$SaCl_3.6H_2O$	10.....	21.84	$SaCl_3.6H_2O$
20.....	48.29	»	20.....	22.42	»
30.....	48.60	»	30.....	23.97	»
40.....	49.20	»	40.....	25.52	»
50.....	49.98	»	50.....	27.49	»

SAMARIUM LACTATE $Sa(C_3H_5O_3)_3.1\,1/2\,H_2O$.

1000 cc. sat. solution of samarium lactate in water contain 11.47 gms. $Sa(C_3H_5O_3)_3.1\,1/2\,H_2O$ at 20°. (Jantsch, 1926.)

SARCOSINE (N-Methyl glycine) $\begin{matrix}COOH\\CH_2NHCH_3\end{matrix}$ or $\begin{matrix}COO\\CH_2NH_2CH_3\end{matrix}$

100 cc. sat. solution of sarcosine in water contain 42.82 gms. of the compound at 20°.

100 cc. sat. solution of sarcosine in aqueous 0.02 molecular CH_3COOK solution contain 36.47 gm. of the compound at 20°. (See Alanine, p. 1019, for details as to the manner in which the determinations were made.) (Pfeiffer and Angern, 1924.)

Freezing-point data for mixtures of sarcosine anhydride and veronal are given by Pfeiffer and Angern, 1926.

SELENIC ACID H_2SeO_4.

Freezing-Points of Mixtures of Selenic Acid and Sulfur Trioxide. (Meyer and Stateczny, 1922.)

A diagram is given and the following numerical data for the principal points of the diagram.

t°.	Gms. SO_3 per 100 gms. mixture.	Solid Phase.	t°.	Gms. SO_3 per 100 gms. mixture.	Solid Phase.
58.....	0.0	H_2SeO_4	— 8.0 Eutec.	40.4	$H_2SeSO_7 + H_2Se_2O_{10}$
—12 Eutec..	23.0	» $+ H_2SeSO_7$	+19.0 m. pt.	53.0	$H_2Se_2O_{10}$
+ 6.6 m. pt.	35.0	H_2SeSO_7	— 7.0 Eutec.	63.9	» $+ SO_3$

SELENIUM Se.

100 cc. of aq. 66 % K OH solution dissolve 9.19 gms. Se. This corresponds to an atomic ratio of 39.15 gm. atoms K : 14.91 gms. atoms Se, which shows that not all of the selenium is in the form of selenide.

100 cc. of aq. 66 % Na OH solution dissolve 2.45 gms. Se.

100 cc. of sat. aq. $Ba(OH)_2$ solution dissolve 2.65 gms. Se after being kept several days at 80°. (Calcagni, 1923.)

Solubility of Selenium in Carbon Disulfide. (Moles and Jimeno, 1915.)

Carefully prepared amorphous red selenium was used. The saturated solutions were analyzed by evaporating at ordinary temperature and weighing the residue after heating to 110°. The solubility of selenium varies with the time which elapses after its preparation and with the time of exposure to light. Amorphous selenium in contact with carbon disulfide is transformed to crystalline selenium. The variations in solubility are probably due to this transformation. It is necessary to admit the existence of many varieties of red crystalline selenium with different solubilities. These varieties owe their origin to the action of the solvent or of light and may be identical with the two monoclinic modifications studi d by Muthmann. Some of the solubility results obtained by the authors are as follows :

t°.	Gms. Se per 100 gms. Se+CS_2.	Conditions of the determination.
?	0.0573	Solubility 1 hour after preparation of sample
?	0.0475	» 24 hours » » » »
?	0.0190	» 1436 » » » » »
3	0.00191	Solution prepared in the dark : 3 hours
12	0.00247	» » » » » » »
12	0.00662	» » » » » 72 »
9	0.0251	Same solution after 48 hours exposure to sunlight
44	0.1586	Solution in boiling CS_2
0	0.0184	The above solution cooled for 20 hours

100 gms. selenium monochloride saturated with selenium by shaking in a thermostat at 25° for a very long time contain 9.73 gms. Se. (Lenher and Kao, 1926.)

Freezing-point data for mixtures of Se + S, Se + Te and Se + S + Te are given by Losana, 1923.

SELENIUM DIOXIDE $SeO_2.H_2O$.

Solubility of Selenium Dioxide in Water, Determined by the Freezing-Point Method. (Manchot and Ortner, 1922.)

t°.	Gms. SeO_2 per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. SeO_2 per 100 gms. sat. sol.	Solid Phase.
— 0.2	0.99	Ice	—20	53.60	Ice
— 1.1	4.88	»	—23 (eutec.)	57.00	» + $SeO_2.H_2O$
— 5.0	21.83	»	—21	58.0	$SeO_2.H_2O$
— 8.2	33.00	»	—12.5	61.6	»
— 9.9	37.64	»	— 7.0	63.4	»
—11.3	40.65	»	+ 7.0	68.32	»
—13.0	44.00	»	22.0	72.52	»
—14.9	47.03	»	42.0	77.50	»
—16.5	49.10	»	65.0	82.50	»

SILICON Potassium Hexa FLUORIDE SiK_2F_6.

100 cc. sat. sol. of silicon potassium hexafluoride in water contain 0.00544 gm. SiK_2F_6 at 17°5. (von Hevesy, Christiansen and Berglund, 1925.)

SILICA HYDRATE $3SiO_2.H_2O$.

Solubility of Silica Hydrate in 3.0 Normal Ammonia at 18°.
(Schwarz, 1916.)

The hydrate was prepared by conducting silicon fluoride into water. It was washed with water and dried at 150°. It contained 9.04 % H_2O. About 0.12 gm. quantities were shaken with 25 cc. portions of 3.0 *n* ammonia and allowed to stand. The amount dissolved per 25 cc. increased with the time of shaking from 0.0144 gm. after 4 hours to 0.0522 gm. after 228 hours. The curve drawn from the results showed that the maximum solubility was reached in about 200 hours. The solubility varies with the water content and modification of the silica. No ammonium silicate was formed.

SILVER Ag.

Data for the distribution of silver between Zn + Pb, Zn + Bi, Al + Pb, Al + Bi, Zn + Tl and Al + Tl are given by Tammann and Schaftmeister, 1924.

SILVER ACETATE CH_3COOAg.

Solubility of Silver Acetate in Aqueous Solutions of Acetic Acid at 25°.
(Knox and Will, 1919.)

Saturation was secured by constant agitation in a thermostat.

Gm. equiv. CH_3COOH per liter.	Gms. CH_3COOAg per liter.	Gm. equiv. CH_3COOH per liter.	Gms. CH_3COOAg per liter.	Gm. equiv. CH_3COOH per liter.	Gms. CH_3COOAg per liter.
0.0	11.13	5.99	8.72	12.32	5 33
1.00	10.73	6.80	8.29	12.97	4.96
2.00	10.32	8.01	7.73	13.97	4.29
2.98	9.98	8.97	7.31	14.96	3.43
4.19	9.52	9.96	6.78	15.93	2.48
4.98	9.19	11.02	6.15	17.28	1.09

100 gms. sat. solution of silver acetate in acetic acid contain 0.094 gm. CH_3COOAg at 76° and 0.204 gm. at 115°. (Kendall and Adler, 1921.)

SILVER β Methyl ADIPATE (Neutral Salt).

100 cc. sat. solution of silver β methyl adipate in water contain 0.12 gm. of the compound at 20°. (Meurisse.)

SILVER BENZOATE, Chloro, Nitro, etc. Benzoates.

Solubility of Each Separately in Water at 20°.
(Ephraim and Pfister, 1925.)

Compound.	Formula.	Gms. anhydrous compound per 100 cc. sat. sol.
Silver Benzoate.....	C_6H_5COOAg	0.217
» 4 Chlor Benzoate...	$C_6H_4ClCOOAg$	0.108
» 4-Methoxy » ...	$C_6H_4.OCH_3.COOAg$	0.0518
» 4-Nitro » ...	$C_6H_4.NO_2.COOAg$	0.170
» 4-Oxy » ...	$C_6H_4.OH.COOAg.3H_2O$	0.272

SILVER BROMATE $AgBrO_3$.

Solubility of Silver Bromate in Water.
(Reedy, 1921.)

t°.	Gms. $AgBrO_3$ per 100 gms. H_2O.	t°.	Gms. $AgBrO_3$ per 100 gms. H_2O.	t°.	Gms. $AgBrO_3$ per 100 gms. H_2O.
25.....	0.196	50.....	0.433	75.....	0.832
30.....	0.227	55.....	0.497	80.....	0.936
35.....	0.269	60.....	0.570	85.....	1.055
40.....	0.316	65.....	0.648	90.....	1.325
45.....	0.371	70.....	0.735		

A transition point near 98°.5 is indicated.

Solubility of Silver Bromate in Aqueous Salt Solutions at 25°.
(Dalton, Pomeroy and Weymouth, 1924.)

Constant rotation for at least 16 hours was employed and equilibrium was approached both from above and below.

Salt.	Gm. equiv. salt per 1000 gms. H_2O	Density of sat. sol.	Millimols. $AgBrO_3$ per 1000 gms. H_2O.	Salt.	Gm. equiv. salt per 1000 gms. H_2O.	Density of sat. sol.	Millimols. $AgBrO_3$ per 1000 gms. H_2O.
None (=H_2O) . .	0.0	0.9990	8.062	$Ba(NO_3)_2$. .	0.025	1.0018	9.088
$KClO_4$	0.025	1.0010	8.716	» . .	0.05	1.0046	9.655
»	0.5	1.0033	9.190	» . .	0.10	1.0098	10.373
»	0.10	1.0074	9.706	Na_2SO_4 . .	0.05	1.0025	9.965
K_2SO_4	0.025	1.0009	9.292	» . . .	0.10	1.0059	10.973
»	0.05	1.0028	10.015	» . . .	1.00	1.0622	18.619
»	0.10	1.0062	11.092	$CdSO_4$ . . .	0.10	1.0017	10.405
$Mg(NO_3)_2$. . . .	0.025	1.0003	8.935	» . . .	0.50	1.0492	13.349
»	0.05	1.0018	9.414	$Ce(NO_3)_3$. .	0.0125	1.0002	8.888
»	0.10	1.0046	10.090	» . .	0.025	1.0014	9.336
$MgSO_4$	0.02	–	8.92	KNO_3	0.040	–	9.12
»	0.051	–	9.67	» . . .	0.100	–	9.92
»	0.100	–	10.30	»	0.200	–	11.06
»	0.1988	–	11.38	»	0.394	–	12.66

SILVER BROMIDE AgBr.

Solubility in Aqueous Solutions of Ammonium Bromide and of Gelatin.
(Winther, 1923, 1924.)

The determinations were made by measurements of the electromotive force of a series of elements of the type:

$$Ag \mid 0.1\,n\,AgNO_3 \mid Aq.\ 10\%\ NH_4NO_3 \mid x \mid Ag,$$

where x is a mixture of Ag Br and of the solution in which its solubility is to be measured. Two identical elements were measured for each solution. The potential, π, very soon attained a constant value which did not change for many hours. The mean value for the exponents of the solubility products in solutions composed of various mixtures of ammonium salts, gelatin and erythrosine, was 11.92. Since the solubility product in all of the solutions had the same value it was concluded that the solubility of silver bromide in water is not altered by the addition of gelatin, erythrosine and small amounts of NH_4I and NH_4Cl. By the addition of bromide the solubility is decreased in accordance with the law of mass action.

Fusion-point data for mixtures of Ag Br + Na Br are given by Zemcznzny, 1926.

SILVER CARBONATE Ag_2CO_3.

100 gms. sat. solution of silver carbonate in water at 18° and in contact with CO_2 at a pressure of 1 atmosphere, contain 0.105 gm. Ag_2CO_3. At a pressure of 56 atmospheres of CO_2, 0.170 gm. Ag_2CO_3 are dissolved. (Haehnel, 1924.)

SILVER PerCHLORATE $AgClO_4.H_2O$.

Solubility of Silver Perchlorate in Water. (Hill, 1922.)

t°.	d of sat. sol.	Gms. $AgClO_4$ per 100 gms. sat. sol.	Solid Phase.	t°.	d of sat. sol.	Gms. $AgClO_4$ per 100 gms. sat. sol.	Solid Phase.
— 0.16. . . .	–	0.96	Ice	0. .	2.667	81.3	$AgClO_4.H_2O$
— 3.0.	–	26.55	»	25. .	2.806	84.5	»
—10.0.	–	45.2	»	43. .	–	86.5	»+$AgClO_4$
—24.0.	–	60.3	»	50. .	2.995	87.2	$AgClO_4.H_2O$ (unst.)
—40.0.	–	70.4	»	75. .	3.022	88.1	$AgClO_4$
—58.2Eutec. .	2.315	73.9	»+$AgClO_4.H_2O$	99. .	3.069	88.8	»

EQUILIBRIUM IN THE SYSTEM SILVER PERCHLORATE, ANILINE AND WATER AT 25°.
(Hill and Macy, 1924.)

d of sat. sol.	Gms. per 100 gms. sat. sol. $AgClO_4$.	$C_6H_5NH_2$.	Solid Phase.	d of sat. sol.	Gms. per 100 gms. sat. sol. $AgClO_4$.	$C_6H_5NH_2$.	Solid Phase.
1.063	5.00	95.00	1.6	1.066	8.32	trace	1.3+1.2
–	7.18	91.56	»	1.086	10.7	»	1.2
–	8.00	90.00	»	–	21.39	»	»
1.096	8.48	88.92	»	1.294	28.55	»	»
1.106	9.42	86.34	»	–	53.71	»	»
1.001	trace	4.57	»	–	57.13	»	»+1.1
–	»	trace	»+1.3	1.859	60.02	»	1.1
1.007	1.02	»	1.3	–	70.00	»	»
1.018	2.53	»	»	2.634	81.3	»	»
–	5.94	»	»	»	84.22	»	»+$AgClO_4.H_2O$
1.059	7.03	»	»	2.806	84.5	0.0	$AgClO_4.H_2O$

1.6=$AgClO_4.6C_6H_5NH_2$; 1.3=$AgClO_4.3C_6H_5NH_2$; 1.2=$AgClO_4.2C_6H_5NH_2$; 1.1=$AgClO_4.C_6H_5NH_2$.

The following results are given for the distribution (Binodal) curve.

Aqueous Phase.			Aniline Phase.		
% $AgClO_4$.	% $C_6H_5NH_2$.	% H_2O.	% $AgClO_4$.	% $C_6H_5NH_2$.	% H_2O.
0.0	3.66	96.34	0.0	94.78	5.22
–	–	–	2.70	92.48	4.82
–	–	–	6.29	89.40	4.31
trace	5.57	95.43	9.42	86.34	4.24

Data are then given for the composition of the ternary solutions in the invariant and monovariant equilibria at —58.8° to +66°, and selected isotherms in this range of temperatures are shown schematically by means of triangular diagrams.

SOLUBILITY OF SILVER PERCHLORATE IN ANILINE. (Hill and Macy, 1924.)

t°.	d of sat. sol.	Gms. $AgClO_4$ per 100 gms. sat. sol.	Solid Phase.	t°.	d of sat. sol.	Gms. $AgClO_4$ per 100 gms. sat. sol.	Solid Phase.
— 6.15 m. pt.	–	0.00	$C_6H_5NH_2$	55.0....	1.281	30.9	1.6
— 6.6.....	1.030	0.74	»+1.6	48.3 tr. pt.	–	33.0	»+1.3
+25.0.....	1.063	5.0	1.6	58.1....	1.101	35.0	1.3
40.0.....	–	11.4	»	66.6 tr. pt.	–	38.4	»+1.2
50.1.....	–	17.0	»	88.0....	–	40.0	1.2
60.52*...	–	27.06	»	48.0 m. pt.	–	100.0	$AgClO_4$

* Congruent m. pt., For 1.6, 1.3 and 1.2, see above.

SOLUBILITY IN THE SYSTEM SILVER PERCHLORATE, BENZENE AND WATER AT 25°.
(Hill, 1922.)

d of sat. sol.	Gms. per 100 gms. sat. sol. $AgClO_4$.	C_6H_6.	Solid Phase.	d of sat. sol.	Gms. per 100 gms. sat. sol. $AgClO_4$.	C_6H_6.	Solid Phase.
2.806	84.45	0.0	$AgClO_4.H_2O$	1.200	31.92	67.03	$AgClO_4.C_6H_6$
2.823	84.28	1.19	»	1.197	31.45	67.54	»
–	84.1	1.7	»+$AgClO_4.C_6H_6$	1.123	25.40	73.90	»
2.806	83.98	1.68	$AgClO_4.C_6H_6$	1.021	15.37	84.29	»
2.808	83.93	1.36	»	1.009	13.90	85.82	»
2.747	83.12	1.55	»	–	10.65	89.13	»
2.644	81.39	1.41	»	0.960	10.45	89.34	»
–	75.53	7.75	»	0.949	9.55	90.26	»
2.103	69.27	15.81	»	0.947	9.01	90.84	»
1.978	65.69	22.32	»	0.9367	8.28	91.60	»
1.851	62.01	28.14	»	0.9332	7.31	92.58	»
1.562	51.89	43.18	»	0.9259	6.84	93.08	»
1.462	46.80	50.34	»	0.9221	6.18	93.77	»
1.358	42.57	55.53	»	0.9205	5.96	94.00	»
1.254	35.20	63.52	»	0.906	5.00	95.00	»

Distribution Curve for the System Silver Perchlorate, Benzene and Water at 25°. (Hill, 1922.)

The components were weighed into a small cylinder and rotated at 25° untill equilibrium was established. Samples of each layer were titrated for their silver content. The benzene and water were determined indirectly. For this purpose a weighed amount of each solution was treated with an excess of anhydrous silver perchlorate and agitated at 25° untill equilibrium was reached. The silver perchlorate now present in the solution was determined by titration and the point corresponding to this composition on the 25° solubility curve (see preceding page), was taken as giving the relative proportions of water and benzene present. The volumes of both phases in the original experiment were read in the calibrated cylinder, so that the water and benzene content of the phase L_3 was known by subtraction of the composition of L_1 from the known total composition.

Composition of Conjugated Solutions.

Lower layer L_3:				Upper layer L_1:			
	Gms. per 100 gms. mixture				Gms. per 100 gms. mixture		
$d_{25°}$	$AgClO_4$.	C_6H_6.	H_2O.	$d_{25°}$	$AgClO_4$.	C_6H_6.	H_2O.
–	0.00	0.08	99.92	–	0.00	99.95	0.061
1.628	50.81	0.10	49.09	0.869	0.030	99.91	0.06
1.821	59.30	1.00	39.70	0.870	0.052	99.89	0.06
2.050	67.73	1.96	30.31	0.873	0.25	99.69	0.06
2.127	70.52	3.76	25.72	0.879	0.77	99.17	0.06
2.071	69.31	11.17	19.51	0.881	1.55	98.37	0.076
1.749	60.06	26.15	13.78	0.881	1.59	98.32	0.090
1.653	57.88	30.74	11.38	0.882	1.74	–	–
1.566	54.22	36.36	9.42	0.882	1.85	–	–
1.442	46.95	47.57	5.47	0.891	2.90	97.00	0.0969
1.348	41.74	55.00	3.26	0.903	4.28	95.61	0.119
1.296	38.80	58.62	2.57	0.916	5.80	94.05	0.148
1.218	35.28	63.23	1.49	0.937	8.42	91.41	0.168
1.200	31.92	67.03	1.04	0.960	10.42	89.34	0.21
1.162	31.12	68.06	0.82	0.983	13.58	86.13	0.287

Data are also given for the composition of the ternary solutions of the invariant (Quintuple points) and monovariant equilibrium at — 58°.4 to 145°, and selected isotherms in this range of temperatures are shown schematically by means of triangular diagrams.

Solubility of Silver Perchlorate in Benzene. (Hill, 1922.)

t°.	d of sat. sol.	Gms. $AgClO_4$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $AgClO_4$ per 100 gms. sat. sol.	Solid Phase.
5.48	–	0.00	C_6H_6	115.5	50.5	$AgClO_4.C_6H_6$
5.12	0.909	3.44	»+$AgClO_4.C_6H_6$	138.5	60.0	»
25.0	0.906	5.00	$AgClO_4.C_6H_6$	140.0	62.6	$AgClO_4$ (unstable)
50.0	0.896	10.07	»	145.0	63.0	»+$AgClO_4.C_6H_6$
80.3	1.164	32.2	»	159.0	64.6	$AgClO_4$
92.0	–	40.1	»	160	65.6	»

Solubility of Silver Perchlorate in Benzene Containing Small Amounts of Water at 25°. (Hill, 1923.)

Gms. H_2O per 100 gms. $C_6H_6+H_2O$ mixture.	Gms. $AgClO_4$ per 100 gms. sat. sol.	Gms. H_2O per 100 gms. $C_6H_6+H_2O$ mixture.	Gms. $AgClO_4$ per 100 gms. sat. sol.
0.00 (= pure C_6H_6)	4.981	0.1407	8.351
0.0384	5.900	0.1648	8.928
0.0547	6.267	0.1810	9.316
0.0798	6.892	0.1868	9.455
0.1110	7.639	0.2070	9.938

One liter of benzene in contact with one liter of water containing 2.325 gms. $AgClO_4$ dissolves less than 0.0000506 gm. $AgClO_4$ at 25°. (Hill, 1921.)

Equilibrium in the System Silver Perchlorate, Pyridine and Water at 25°. (Macy, 1925.)

Constant agitation was employed for obtaining saturation. Highly purified materials were used.

d of sat. sol.	Gms. per 100 gms. sat. sol. $AgClO_4$.	C_5H_5N.	Solid Phase.	d of sat. sol.	Gms. per 100 gms. sat. sol. $AgClO_4$.	C_5H_5N.	Solid Phase.
1.201	20.9	79.1	1.4	–	10.76	0.0	4.9
1.185	19.5	69.9	»	1.156	17.0	0.0	»
1.170	17.8	65.9	»	–	17.4	0.0	»
1.135	14.5	60.0	»	1.186	20.0	0.0	» +1.2
1.093	9.8	51.0	»	–	20.2	0.0	1.2
1.060	6.6	42.4	»	–	35.6	0.0	»
1.014	1.3	20.6	»	–	54.6	0.0	»
1.005	0.48	5.38	»	–	77.0	0.0	»
1.002	0.40	3.8	» +4.9	–	84.3	0.0	» +$AgClO_4.H_2O$
1.065	7.0	trace	4.9	2.806	84.5	0.0	$AgClO_4.H_2O$

Solubility of Silver Perchlorate in Pyridine. (Macy, 1925.)

At the lower temperatures a Beckmann freezing-point apparatus was used.

t°.	d of sat. sol.	Gms. $AgClO_4$ per 100 gms. sat. sol.	Solid Phase.	t°.	d of sat. sol.	Gms. $AgClO_4$ per 100 gms. sat. sol.	Solid Phase.
−40.3 f. pt.	–	0.0	C_5H_5N	60.4...	–	34.5	1.4
−41.5...	–	4.0	»	66.8...	–	41.1	»
−43.0...	–	7.2	» +1.4	68.0...	–	41.7	» +4.9
−35.0...	–	8.3	1.4	71.0...	–	42.4	4.9
−11.5...	1.118	12.23	»	75.0...	–	43.0	»
− 1.3...	1.139	14.53	»	86.3...	–	45.8	»
+25.0...	1.201	20.90	»	95.6...	–	47.8	» +1.2
36.1...	1.221	24.52	»	110.....	–	50.0	1.2
49.2...	1.278	29.4	»	144–147.	–	–	» +$AgClO_4$

$1.4 = AgClO_4.4\,C_5H_5N$; $4.9 = 4\,AgClO_4.9\,C_5H_5N$; $1.2 = AgClO_4.2\,C_5H_5N$.

A few determinations made with Kahlbaum's pyridine gave results about 1.5 % higher than the above, due possibly to the presence of homologues of pyridine.

Equilibrium in the System Silver Perchlorate, Toluene and Water at 25° (Hill and Miller, Jr., 1925.)

Results for solutions in contact with :

	$AgClO_4$. Gms. per 100 gms. sat. sol.				$AgClO_4.H_2O$. Gms. per 100 gms. sat. sol.		
d of sat. sol.	$AgClO_4$.	$C_6H_5.CH_3$.	H_2O.	d of sat. sol.	$AgClO_4$.	$C_6H_5CH_3$.	H_2O.
1.525	50.30	49.70	0.0	1.675	56.66	41.51	1.92
1.580	52.54	46.86	0.60	–	56.95	40.07	2.86
1.606	53.49	45.49	1.02	1.696	57.44	38.96	3.67
1.628	54.75	43.84	1.41	1.702	57.56	38.72	3.86
1.639	54.92	43.66	1.42	1.710	57.96	37.98	4.12
1.672	56.65	41.46	1.89	1.709	58.11	37.72	4.16
1.675	56.66	41.42	1.92	1.715	58.34	37.32	4.19

The authors made a complete investigation of the ternary system and found seven invariant 5-phase points and twenty 4-phase equilibria between the temperatures −94° and +91°.75. The numerical data for these are given. The system shows, in addition to the solubility curves for the three solid phases (silver perchlorate, its hydrate and its compound with toluene), two binodal curves, one of which is submerged and does not reach any of the two component axes at any temperature. The intersection of the two binodal curves, at certain points which are not their plait points, gives rise to a 3-liquid system which is stable from −24°.1 to above +90°.

DISTRIBUTION (BINODAL) CURVES FOR THE SYSTEM SILVER PERCHLORATE, TOLUENE AND WATER AT 25°. (Hill and Miller, Jr, 1925.)

Results for the conjugate Solutions (Showing mutual Solubility of Toluene and Water as affected by the presence of Silver perchlorate).

Upper layer L_1.				Lower Layer L_2.			
	Gms. per 100 gms. mixture.				Gms. per 100 gms. mixture.		
$d_{25°}$.	$AgClO_4$.	$C_6H_5CH_3$.	H_2O.	d_{25}.	$AgClO_4$.	$C_6H_5CH_3$.	H_2O.
0.854...	0.0	100.0	0.0	1.344...	33.34	0.0	66.64
0.850...	0.0	100.0	0.0	1.436...	39.37	0.0	60.03
0.852...	0.0	100.0	0.0	1.730...	55.21	1.59	43.20
0.914...	7.37	92.48	0.19	2.360...	75.57	2.1	22.33
1.307...	39.35	56.93	3.70	2.360...	75.57	2.1	22.33
1.372...	43.44	52.01	4.55	2.389...	76.09	2.2	21.71
1.442...	45.88	49.65	4.77	2.421...	76.28	2.25	21.47
1.491...	49.07	45.98	4.95	2.480...	78.00	2.4	20.6
1.574...	54.08	40.47	5.45	— ...	80.64	2.45	16.91
1.715...	58.34	37.32	4 34	2.830...	84.29	2.52	13.19

The following results were obtained for the submerged binodal curve at 25°.

0.914...	7.37	92.48	0.19	1.307...	39.35	56.95	3.70
0.930...	8.97	91.73	0.30	1.261...	36.26	60.69	3.05
0.951...	11.00	88.64	0.36	1.210...	32.18	65.54	2.28
1.005...	16.04	83.17	0.79	— ...	26.67	71.73	1.60
— ...	21.0	77.9	1.1	— ...	21	77.9	1.1

SOLUBILITY OF SILVER PERCHLORATE IN TOLUENE.
(Hill and Miller, Jr, 1925.)

t°.	d of sat. sol.	Gms. $AgClO_4$ per 100 gms. sat. sol.	Solid Phase.	t°.	d of sat. sol.	Gms. $AgClO_4$ per 100 gms. sat. sol.	Solid Phase.
—75.3...	0.854	0.0	$AgClO_4.C_7H_8$	18.....	1.417	44.11	$AgClO_4.C_7H_8$
—24.1...	0.920	6.01	»	22.6 tr.pt.	—	—	» + $AgClO_4$
0.....	1.129	26.41	»	25.....	1.523	50.30	$AgClO_4$
16.....	1.375	42.0	»	50.....	1.576	52.68	»
16.5...	1.388	42.89	»	75.....	1.665	54.60	»

SILVER CHLORIDE AgCl.

SOLUBILITY OF SILVER CHLORIDE IN WATER AND IN SALT SOLUTIONS.

A method was developed by Lorenz and Bergheimer, 1924, which consisted in the alternate addition of drops (each of 0.02 cc.) of 0.005 *n* Na Cl and $AgNO_3$ to 500 cc. of water or of solutions of electrolytes illuminated by a beam of light, in such a manner that the first sign of clouding, and the point of permanent opalescence, could be accurately determined. The solubility results calculated from their observations confirmed previous data showing the dependance of the solubility of silver chloride upon temperature. Their values agree in general with published results obtained by other methods and verify the Nernst formula for the solubility influence of electrolytes.

Experiments are reported by Langdon, 1923-1924, in which the E. M. F. of the cells

$$Ag\,|\,0.1\,n\,AgNO_3\,|\,0.1\,n\,KNO_3\,|\,0.1\,n\,KCl.Hg_2Cl_2\,|\,Hg$$

and

$$Ag\,|\,AgCl.KCl\,|\,0.1\,n\,KCl\,|\,0.1\,n\,KCl.Hg_2Cl_2\,|\,H_2O$$

were measured. There was a definite increase in the solubility product with increasing concentration of KCl. The solubility of freshly formed colloidal silver chloride, whether protected or unprotected, is higher than that of coarse silver chloride, and this solubility gradually decreases to the normal value. The increased solubility of the colloidal AgCl probably depends on the amount and concentration of the solutions from which it is formed. Gelatin apparently tends to retard the attainment of the normal solubility.

SOLUBILITY OF SILVER CHLORIDE IN AQUEOUS SOLUTIONS OF CHLORIDES AT 25°.

(Results of Forbes and Cole, 1921.)

To volumes of about 500 cc. of aqueous chloride solutions, less than 0.1 *n* in concentration, maintained at 25° and well stirred, 0.001 *n* $AgNO_3$ solution was added in amount just sufficient to cause opalescence. The concentrations are expressed in milliequivalents per liter.

In Aq. NaCl.		In Aq. HCl.		In 0.35 *n* Chloride solutions.		
Total NaCl.	Total Ag.	Total HCl	Total Ag.	Chloride Taken.	Total Chloride.	Total Ag.
3.86	0.00072	4.78	0.00075	HCl	34.1	0.00219
9.24	0.00091	9.38	0.00084	NaCl	36.5	0.00189
17.58	0.00131	17.8	0.00125	NH_4Cl	37.4	0.00162
36.54	0.00189	34.1	0.00219	KCl	36.7	0.00172
88.44	0.00361	74.1	0.00361	RbCl	37.7	0.00181
355.6	0.0174	91.4	0.00426	$\frac{CaCl_2}{2}$	38.6	0.00175
511.2	0.0280	316.7	0.01403	$\frac{SrCl_2}{2}$	36.9	0.0172
974.7	0.0806	681.8	0.0448	$\frac{BaCl_2}{2}$	37.5	0.0157
		779.7	0.0554			
		925.8	0.0719			

(Results of Kendall and Sloan, 1925.)

In Aq. NaCl.		In Aq. LiCl.		In Aq. $MgCl_2$.	
Gm. equiv. per liter.		Gm. equiv. per liter.		Gm. equiv. per liter.	
[NaCl].	[AgCl]×10³.	[LiCl].	[AgCl]×10³.	½[$MgCl_2$].	[AgCl]×10³.
0.90	0.099	0.44	0.100	2.60	0.580
1.10	0.131	1.24	0.180	2.86	0.768
1.39	0.183	1.65	0.281	3.34	1.165
1.61	0.253	2.10	0.605	3.85	1.773
1.93	0.391	2.44	1.010	4.20	2.345
2.22	0.542	2.74	1.480	4.30	2.530
2.87	1.000	3.01	2.458	4.58	3.138
3.16	1.366	3.30	3.278	4.66	3.338
3.82	2.491	3.40	3.925	4.91	4.042
4.39	3.825	3.60	5.084	5.36	5.264
4.81	5.104	3.75	5.922		
5.00	5.882	3.78	6.000		

Fusion-point data for mixtures of silver chloride and sodium chloride are given by Zemcznzny, 1926. Results for mixtures of silver chloride and tellurium chloride are given by Biltz and Friedrich, 1924.

SILVER CINNAMATE $C_6H_5.CH:CHCOOAg$.

100 gms. sat. solution of silver cinnamate in water contain 0.012 gms. $C_6H_5CH:CHCOOAg$ at 20°. (Ephraim and Pfister, 1925.

SILVER CHROMATE Ag_2CrO_4.

Silver nitrate solutions were added to excess of various mixtures of potassium chromate and iodate dissolved in water, and the distribution of silver between CrO_4 and IO_3 determined at various temperatures and after various lengths of time. (Ramann and Sallinger, 1921.)

SILVER FUMARATE $C_4H_2O_4Ag$.

100 gms H_2O dissolve 0.013 gm. silver fumarate at 30°. (Weiss and Downs, 1923.)

SILVER HELIANTHATE $C_{14}H_{14}N_3SO_3Ag.2H_2O$.

1000 cc. H_2O dissolve 0.292 gm. $C_{14}H_{14}N_3SO_3Ag.2H_2O$ at 20-25°. (Stark and Dehn, 1918.)

SILVER Nitroso β Phenyl**HYDROXYLAMINE.**

100 gms. H_2O dissolve 0.0013 gm. of the compound at 18°. (Martin.)

SILVER IODATE $AgIO_3$.

SOLUBILITY OF SILVER IODATE IN AQUEOUS SALT SOLUTIONS AT 75°. (Baxter, 1926.)

Constant agitation in sealed tubes was employed and equilibrium was approached from above and from below.

Salt.	Millimols. salt per 1000 gms. H_2O.	Millimols. $AgIO_3$ per 1000 gms. H_2O.	Salt.	Millimols. salt. per 1000 gms. H_2O.	Millimols. $AgIO_3$ per 1000 gms. H_2O.
None (= H_2O)	0.0	0.8403	K_2SO_4	2.0	0.9024
$KClO_3$	2.0	0.8661	»	5.0	0.9603
»	5.0	0.8900	»	10.0	1.0241
»	10.0	0.9143	»	20.0	1.1110
»	20.0	0.9503	»	50.0	1.2932
»	50.0	1.0183	$Ba(NO_3)_2$	0.5	0.8646
»	100.0	1.0882	»	1.0	0.8717
KNO_3	1.0	0.8547	»	2.0	0.8973
»	2.0	0.8660	»	5.0	0.9322
»	5.0	0.8875	»	10.0	0.9664
»	10.0	0.9158	$MgSO_4$	0.2	0.8522
»	20.0	0.9570	»	0.5	0.8698
»	50.0	1.0365	»	1.0	0.8855
»	100.0	1.1258	»	2.0	0.9111
K_2SO_4	0.5	0.8555	»	5.0	0.9629
»	1.0	0.8760	»	10.0	1.0201
			»	20.0	1.0928

SILVER MALEATE $C_4H_2O_4Ag$.

100 gms. H_2O dissolve 0.12 gm. silver maleate at 30°. (Weiss and Downs, 1923.)

SILVER NITRATE $AgNO_3$.

SOLUBILITY OF SILVER NITRATE IN WATER. (Kazantzev, 1923, 1925.)

t°.	Gms. $AgNO_3$ per 100 gms. sat. sol.	t°.	Gms. $AgNO_3$ per 100 gms. sat. sol.
0	55.6	30	74.1
10	63.3	30	73.82*
15	66.65	50	80.2
25	71.8	100	90.0

*(Cohen, de Meester and Moesveld, 1924.)

SOLUBILITY OF SILVER NITRATE IN AQUEOUS SOLUTIONS OF NITRIC ACID. (Kazantzev, 1923, 1925.)

Results at 15°.

d_4^{15} of sat. sol.	Gms. per 100 gms. sat sol. HNO_3.	Gms. per 100 gms. sat sol. $AgNO_3$.
2.1196	0.0	66.65
2.0703	0.6	64.9
1.9847	1.5	61.4
1.8745	3.0	55.6
1.6436	7.25	44.2
1.4414	15.2	28.4
1.4001	18.4	23.8
1.3528	28.7	14.5
1.3533	38.8	8.9
1.4016	59.3	3.0
–	72.3	1.3

Results at Several Temperatures.

Gms. HNO_3 per 100 gms. sat. sol.	Gms. $AgNO_3$ per 100 gms. sat. solution at 0°.	15°.	30°.	50°.	100°.
5.0	38.2	50.5	59.1	67.9	80.5
10.0	27.8	38.3	46.8	56.2	71.3
15.0	21.1	29.0	36.8	46.0	62.3
20.0	16.2	22.0	28.9	36.7	54.0
30.0	10.1	13.7	17.7	23.3	38.7
40.0	6.4	8.5	11.2	14.3	25.7
50.0	4.0	5.2	7.0	8.6	15.7
60.0	2.1	3.0	3.9	5.8	9.3
70.0	–	1.4	2.3	3.3	–
80.0	–	0.8	0.9	1.5	–
95.0	–	1.2	1.2	1.2	–
96.5	–	1.3	–	–	–

DISTRIBUTION OF SILVER NITRATE BETWEEN WATER AND ANILINE AT 15-17°. (Frumkin and Kulvarskaja, 1924.)

Concentration of $AgNO_3$ in H_2O layer (C_1).	Concentration of $AgNO_3$ in $C_6H_5NH_2$ layer (C_2).	$\frac{C_2}{C_1}$.	Concentration of $AgNO_3$ in H_2O layer (C_1).	Concentration of $AgNO_3$ in $C_6H_5NH_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.00533	0.900	173	0.00051	0.0190	37
0.00187	0.198	106	0.00020	0.00605	23
0.00082	0.067	82	0.00012	0.00170	14

The authors do not define the terms in which the concentration is expressed.

SOLUBILITY OF SILVER NITRATE IN SEVERAL SOLVENTS. (Müller, R., 1924.)

Very carefully dehydrated solvents were employed and saturation was obtained by constant shaking in sealed tubes.

Solvent.	Gms. $AgNO_3$ per 100 cc. solvent at 0°.	20°.	25°.	Solvent.	Gms. $AgNO_3$ per 100 cc. solvent at 0°.	20°.	25°.
Methyl alcohol....	–	2.84	–	Pyridine.....	30.02	–	45.24
Ethyl alcohol.....	–	1.67	–	Quinoline....	–	–	5.58
Iso amyl alcohol..	–	–	0.54	Aniline.....	–	18.5	–
Iso propyl alcohol.	–	1.38	–	Acetonitrile...	–	–	138.2
Ethyl acetate.....	–	2.42	–	Benzonitrile..	–	15.4	–
Acetone.....	–	0.50	–				

SILVER OXIDE Ag_2O.

SOLUBILITY OF SILVER OXIDE (OR HYDROXIDE) IN WATER AT 18°. (Remy, 1925.)

The determinations were made by (1) the ordinary electrolytic conductivity method, taking into consideration the carbonate content of the water and assuming that the compound is present as completely dissociated hydroxide, and (2) by a conducto-titrametric method.

By method (1) there was found 0.0248 gm. or 0.107 millimols Ag_2O per liter.
» (2) » 0.0253 » 0.109 » »

A determination by Jellinek and Gordon, 1924, at room temperature, made by the electrical method, gave 0.08 millimol. silver hydroxide per liter.

SOLUBILITY OF SILVER OXIDE IN AQUEOUS SOLUTIONS OF AMMONIA. (Olmer, 1924.)

Saturation was obtained by agitation for two hours at room temperature and allowing the solution to stand for exactly 24 hours.

Gm. Mols. NH_3 per liter.	Gm. Atoms Ag per liter.	Ratio $\frac{NH_3}{Ag}$.	Gm. Mols. NH_3 per liter.	Gm. Atoms Ag per liter.	Ratio $\frac{NH_3}{Ag}$.
0.294	0.088	3.340	2.941	0.848	3.468
0.588	0.181	3.248	3.521	0.986	3.571
0.882	0.258	3.418	4.049	1.092	3.708
1.176	0.355	3.312	4.056	1.191	3.741
1.471	0.456	3.225	5.001	1.304	3.835
1.765	0.526	3.355	5.469	1.363	4.012
2.059	0.585	3.519	5.76	1.369	3.93
2.353	0.710	3.314			

SOLUBILITY OF SILVER OXIDE IN AQUEOUS SOLUTIONS OF METHYL AMINE. (Olmer, 1924.)

The flasks were agitated from time to time and allowed to stand 24 hours.

Gm. Mols. CH_3NH_2 per liter.	Gm. Atoms Ag per liter.	Ratio $\frac{CH_3NH_2}{Ag}$.	Gm. Mols. CH_3NH_2 per liter.	Gm. Atoms Ag per liter.	Ratio $\frac{CH_3NH_2}{Ag}$.
0.440	0.104	4.230	3.556	0.759	4.685
1.412	0.340	4.153	5.716	0.954	5.991
2.095	0.504	4.156	8.230	0.885	9.299
3.279	0.731	4.485	9.333	0.658	14.18

SOLUBILITY OF SILVER OXIDE IN MIXTURES OF WATER AND ALCOHOL AT 25°. (Klosky and Woo, 1926.)

Carefully purified materials were used. Saturation was secured by constant stirring for 10 hours. The dissolved Ag_2O was determined by adding a small amount of 0.1 *n* KCl and measuring the turbidity produced, against known standards.

Wt. % C_2H_5OH in solvent.	Gms. Ag_2O per liter sat. sol.	Wt. % C_2H_5OH in solvent.	Gms. Ag_2O per liter sat. sol.
0.0	0.0262	45.70	0.0174
10.95	0.0197	64.00	0.0145
22.92	0.0181	77.00	0.0120
34.30	0.0176	91.50	0.0091

SILVER PALMITATE $CH_3(CH_2)_{14}COOAg$.

1000 cc. sat. solution of silver palmitate in water contain 0.00123 gm. $C_{15}H_{31}COOAg$ at 20°. (Whitby, 1926.)

SILVER PROPIONATE C_2H_5COOAg.

SOLUBILITY OF SILVER PROPIONATE IN AQUEOUS SOLUTIONS OF PROPIONIC ACID AT 25°. (Knox and Will, 1919.)

Gm. equiv. C_2H_5COOH per liter.	Gms. C_2H_5COOAg per liter.	Gm. equiv. C_2H_5COOH per liter.	Gms. C_2H_5COOAg per liter.	Gm. equiv. C_2H_5COOH per liter.	Gms. C_2H_5COOAg per liter.
0.00	9.04	2.97	7.60	8.56	4.96
1.00	8.58	4.95	6.78	11.40	3.16
2.00	8.01	6.98	5.78	13.03	3.17

SILVER SALICYLATE $OH.C_6H_4COOAg$.

1000 cc. sat. solution of silver salicylate in water contain 0.00332 gm. mols. $OH\,C_6H_4\,CO\,O\,Ag$ at 18°. (Kolthoff, 1926.)

SILVER *o* and *p* Xylol **SELENATES** $(CH_3)_2(1.2)C_6H_3(4)SeO_3Ag$ and $(CH_3)_2(1.4)C_6H_3(4)SeO_3Ag.H_2O$.

100 gms. H_2O dissolve 1.29 gms. of the ortho compound at 23°.
» » » 3.02 » » anhydrous para compound at 18°.
(Anschütz, Kallen and Riepenkröger, 1919.)

SILVER STEARATE $CH_3(CH_2)_{16}COOAg$.

1000 cc. sat. solution of silver stearate in water contain 0.00065 gm. $C_{17}H_{35}CO\,O\,Ag$ at 20°. (Whitby, 1926.)

SILVER SULFATE Ag_2SO_4.

Freezing-point data for mixtures of $Ag_2SO_4 + H_2SO_4$ are given by Kendall and Davidson, 1921.

SILVER SULFIDE Ag_2S.

Fusion-point data for mixtures of Ag_2S and Tl_2S are given by Huber, 1921.

SILVER SULFONATES.

SOLUBILITY OF EACH SEPARATELY IN WATER. (Ephraim and Pfister, 1925*a*.)

Compound.	Formula.	t°.	Gms. anhydrous compound per 100 cc. sat. sol.
Silver anthracene-1-sulfonate.....	$AgC_{14}H_9SO_3$	20	0.059
» » -2- »	»	20	0.0318
» naphthalene-2- »	$AgC_{10}H_7SO_3$	16.5	1.716
» » -5-chlor-1-sulfonate..	$AgC_{10}H_6SO_3Cl$	20	0.551

SILVER TARTRATE $C_4H_4O_6Ag_2$.

SOLUBILITY OF SILVER TARTRATE IN WATER AND IN AQUEOUS SOLUTIONS OF BORIC ACID AT 18°. (Kolthoff, 1926.)

Solvent.	Normality of sat. sol. in Ag ions.	Gms. $C_4H_4O_6Ag_2$ per liter.
Water.....	0.0086	1.42
Aq. 0.1 mol. H_3BO_3.....	0.00148 (?)	2.45 (?)
» 0.5 » »	0.0414	6.87

The above gram quantities were calculated by multiplying the normality of Ag ions by one-half the molecular weight of silver tartrate.

SOLANINE $C_{52}H_{93}NO_{18}$.

Solubility of Solanine in Water at 15°.

(Kolthoff, 1925.)

This alkaloid is extraordinarily insoluble. In order to determine its *dissociation constant*, the p_H was measured colorimetrically in mixtures of 5 cc. of 0.0108 *n* solanine chloride solution + 50-100 cc. of water + 0.54 to 2.7 cc. of 0.01 *n* Na OH. From these measurements it was calculated that $K = 2.2.10^{-7}$. For the determination of the *solubility product* it was found that a mixture of 5 cc. of 0.0108 *n* solanine chloride solution, 50 cc. of water and 0.5 cc. of 0.01 *n* Na OH just gave a slight precipitate on standing. The p_H of the solution was 6.0 and the calculated $(OH') = 6.4.10^{-9}$. From this the solubility product $L_{Solanine} = 6.4.10^{-12}$. Calculating from L and K the solubility of solanine in water corresponds to a concentration of 3.10^{-5} mol. or about 0.025 gm. per liter.

SODIUM Na.

Solubility of Sodium in Ammonia.

(Kraus and Lucasse, 1922.)

t°.	Mol. % Na.	t°.	Mol. % Na.	t°.	Mol. % Na.	t°.	Mol. % Na.
—59.7...	1.62	—47.5 ..	2.50	—41.7...	3.83	—44.4...	5.47
—55.9...	1.81	—46.4...	2.64	—41.6...	4.18	—47.4...	6.27
—51.9...	2.09	—44.6...	2.87	—41.8...	4.46	—51.0...	7.09
—48.6...	2.38	—42.8...	3.18	—42.5...	4.97	—60.0...	8.34

SODIUM ACETATE $CH_3COONa.3H_2O$.

Freezing-Points of Aqueous Solutions of Sodium Acetate.

Results by Klein and Svanberg, 1920.

t° of f. pt.	Gms. CH_3COONa. per 100 cc. sat. sol.	Solid Phase.
—0.36.....	0.82	Ice
—0.91.....	2.05	»
—1.85.....	4.10	»

Results by Sidgwick and Gentle, 1922.

t° of f. pt.	Gms. CH_3COONa. per 100 gms. sat. sol.	Solid Phase.
— 2.96.....	6.107	Ice
— 6.42.....	11.27	»
—11.12.....	16.62	»
—15.17.....	20.57	»

SODIUM β Methyl ADIPATE (Racemic).

100 gms. sat. solution in water contain 36.8 gms. of the salt at 20°. (Meurisse.)

SODIUM ALUMINATES $4Na_2O.3Al_2O_3.16H_2O$, $4Na_2O.Al_2O_3.10H_2O$.

Equilibrium in the System Na_2O, Al_2O_3 and H_2O at 30°.

(Goudriaan, 1922.)

Three samples of highly purified hydrated aluminium hydroxide were prepared, and from these three dehydrated samples were made by prolonged heating at 300° to 400°. Great difficulty was experienced in obtaining equilibrium due to the different forms of the hydroxide and to the viscosity of the Na OH solutions. An effort was made to determine the solid phase in each case by the « rest » method. The mixtures were agitated in many cases for periods of 2 to 3 months. At the lower concentrations of Na OH quite irregular results were obtained. The authors results were plotted and the following approximate values obtained from the curve.

Gms. per 100 gms. sat. sol. Na_2O.	Gms. per 100 gms. sat. sol. Al_2O_3.	Solid Phase.
20.0	10—13	$4Na_2O.3Al_2O_3.16H_2O$
22.0	9.0	»
24.0	6.0	»
26.0	2.5	»
28.0	1.0	»
30.0	2.5	»
32.0	3.7	$4Na_2O.3Al_2O_3.16H_2O$
34.0	5.3	»+ $4Na_2O.Al_2O_3.10H_2O$
36.0	3.0	$4Na_2O.Al_2O_3.10H_2O$
38.0	1.3	»
40.0	0.2	»
40.8	0.1	»+ $Na_2O.3H_2O$

The aluminium hydroxide existing as a gel may be considered as a metastable phase retaining variable quantities of alkali. There is probably a continuous transition between the hydroxide gels and the crystalline hydrate. Aluminium oxide is metastable in regard to the hydrate.

SODIUM AZIDE NaN_3.

100 gms alcohol of $d_{17} = 0.799$ dissolve 0.22 gms. NaN_3 at 0° and 0.46 gms. at the b. pt.; 100 gms. benzene dissolve 0.10 gms. NaN_3 at the b. pt.

(Cranston and Livingstone, 1926.)

SODIUM BENZOATE C_6H_5COONa.

Solubility of Sodium Benzoate in Water. (Sidgwick and Ewbank, 1922.)

t°.	Gms. C_6H_5COONa per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. C_6H_5COONa per 100 gms. sat. sol.	Solid Phase.
— 2.02....	8.36	Ice	59.7....	39.2	C_6H_5COONa
— 4.85....	16.52	»	87 6....	41.26	»
— 8.50...	26.01	»	97.0....	42.28	»
± 0.0.....	38.52	C_6H_5COONa	133.0....	47.30	»
15.0.....	38 59	»	151.3....	50.75	»
30.0.....	38.60	»	186.0....	57 05	»
49.7.....	38.70	»	204.5....	60.43	»

100 gms. 86.5 % glycerol ($d = 1.2326$) dissolve 31.5 gms. C_6H_5COONa at 20°.
» 98.5 % » ($d = 1.2645$) » 28.5 »

(Holm, 1921, 1922.)

SODIUM Hydroxy**BENZOATE** (*o*) (Sodium Salicylate) $C_6H_4OH.COONa.6H_2O$.

Solubility of Sodium Ortho Hydroxy Benzoate in Water.
(Sidgwick and Ewbank, 1922.)

t°.	Gms. $C_6H_4OH.COONa$ (*o*) per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $C_6H_4OH.COONa$ (*o*) per 100 gms. sat. sol.	Solid Phase.
—0.77....	4.94	Ice	17.5....	44.40	$C_6H_4OH.COONa.6H_2O$
—2.65....	13.15	»	20.0....	50.0	»
—5.04....	21.18 (unstable)	»	47.5....	55.1	$C_6H_4OH.COONa$
—1.5.....	20.06	$C_6H_4OH.COONa.6H_2O$	78.5....	59.32	»
+9.0.....	29.61	»	114.0....	64.16	»
12.5.....	35.03	»	137.0....	67.95	»
15.2.....	40.48	»			

SODIUM Hydroxy **BENZOATE** (*m*) $C_6H_4.OH.COONa$.

Solubility of Sodium Meta Hydroxy Benzoate in Water.
(Sidgwick and Ewbank, 1922.)

t°.	Gms. $C_6H_4.OH.COONa$ (*m*) per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $C_6H_4.OH.COONa$ (*m*) per 100 gms. sat. sol.	Solid Phase.
— 3.21....	14.68	Ice	+ 10.0....	58.78	$C_6H_4.OH.COONa$
— 8.85....	30.53	»	110.0....	64.61	»
—17.52....	45.16	»	147.5....	69.75	»

SODIUM Hydroxy **BENZOATE** (*p*) $C_6H_4.OH.COONa$.

Solubility of Sodium Para Hydroxy Benzoate in Water.
(Sidgwick and Ewbank, 1922.)

t°.	Gms. $C_6H_4.OH.COONa$ (*p*) per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $C_6H_4.OH.COONa$ (*p*) per 100 gms. sat. sol.	Solid Phase.
—0.77...	5.075	Ice	36.5....	41.32	$C_6H_4.OH.COONa.5H_2O$
—2.07...	10.43	»	39.0....	45.61	» (unstable)
+7.0....	19.65	$C_6H_4.OH.COONa.5H_2O$	43.0....	45.61	$C_6H_4.OH.COONa$
24.0....	31.47		107.5...	50.51	»
			163.0...	54.93	»

SODIUM Tetra **BORATE** $Na_2B_4O_7.10H_2O$ (Borax).

Solubility of Sodium Tetraborate in Water.
(Sborgi, Bovalini and Medici, 1924; Sborgi, 1924.)

t°	−0.45*	10.0	15.0	25.0	30.0	35.0	40.0	45.0	50.0	55.7
Gms. $Na_2B_4O_7$ per 100 gms. H_2O...	1.10	1.63	2.15	3.19	3.91	5.08	6.67	8.09	10.58	15.16

* Eutectic. The solid phase in all other cases is $Na_2B_4O_7.10H_2O$.

Equilibrium in the System Na_2O, B_2O_3 and H_2O at 0°.

(Rosenheim and Leyser, 1921.)

The mixtures were constantly stirred for 1 to 2 days. The curve plotted from the results is somewhat irregular.

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
NaOH.	H_3BO_3.	Solid Phase.	NaOH.	H_3BO_3.	Solid Phase.
0.639	5.84	–	0.416	1.97 (3)	$Na_2O.2B_2O_3.10H_2O$
1.27	9.2	–	5.143	8.06	»
1.62	11.2	–	7.349	11.44	»
1.65	9.3		8.921	13.76	»
1.23	9.20		9.160	14.07	$Na_2O.2B_2O_3.10H_2O$
1.16	8.96 (1)	$Na_2O.2B_2O_3.10H_2O$	8.794	13.63	+
1.29	9.55	+	8.989	13.65	$Na_2O.B_2O_3.8H_2O$
1.37	9.79	$Na_2O.5B_2O_3.10H_2O$	9.265	12.83	$Na_2O.B_2O_3.8H_2O$
1.09	8.78 (2)		9.845	11.45	»
1.10	8.73		11.130	8.35	»

(1) By analysis the solid phase had the composition $Na_2O.4.54B_2O_3.10.1H_2O$.
(2) » » » » » » » » $Na_2O.3.34B_2O_3.9.71H_2O$.
(3) » » » » » » » » $Na_2O.2.01B_2O_3.10.1H_2O$.

Equilibrium in the System Sodium Tetraborate, Sodium Sulfate and Water at Various Temperatures.

(Sborgi, Bovalini and Cappellini, 1924.)

Constant agitation in a thermostat was employed for securing equilibrium.

	Gms. per 100 gms. sat. sol.				Gms. per 100 gms. sat. sol.		
t°.	$Na_2B_4O_7$.	Na_2SO_4.	Solid Phase.	t°.	$Na_2B_4O_7$.	Na_2SO_4.	Solid Phase.
– 0.45	1.086	0.0	$Na_2B_4O_7.10H_2O$+Ice	30.0	0.0	28.6	$Na_2SO_4.10H_2O$
– 1.38	0.631	3.82	»+$Na_2SO_4.10H_2O$+Ice	31.9	1.41	32.38	»+Na_2SO_4+$Na_2B_4O_7.10H_2O$
1.2	0.0	3.85	$Na_2SO_4.10H_2O$+Ice	35.0	4.829	0.0	$Na_2B_4O_7.10H_2O$
+10.0	1.603	0.0	$Na_2B_4O_7.10H_2O$	35.0	3.405	3.665	»
10.0	1.086	1.843	»	35.0	1.798	24.18	»
10.0	0.806	4.383	»	35.0	1.73	26.95	»
10.0	0.704	8.36	»+$Na_2SO_4.10H_2O$	35.0	1.603	31.64	»
10.0	0.0	8.43	$Na_2SO_4.10H_2O$	35.0	1.579	32.25	»+Na_2SO_4
20.0	2.52	0.0	$Na_2B_4O_7.10H_2O$	35.0	1.263	32.60	Na_2SO_4
20.0	1.108	9.238	»	35.0	0.554	32.91	»
20.0	1.00	16.11	»$Na_2SO_4.10H_2O$	35.0	0.00	33.07	»
20.0	0.0	16.23	$Na_2SO_4.10H_2O$	45.0	7.49	0.00	$Na_2B_4O_7.10H_2O$
25.0	3.087	0.0	$Na_2B_4O_7.10H_2O$	45.0	6.361	4.258	»
25.0	2.626	1.187	»	45.0	4.112	13.992	»
25.0	2.057	3.22	»	45.0	3.124	30.15	» +Na_2SO_4
25.0	1.442	9.645	»	45.0	1.145	31.273	Na_2SO_4
25.0	1.300	12.66	»	45.0	0.600	41.649	»
25.0	1.248	15.57	»	49.3	4.584	29.245	» +$Na_2B_4O_7.10H_2O$
25.0	1.229	16.76	»				+$Na_2B_4O_7.5H_2O$
25.0	1.220	17.38	»	50.0	9.52	0.0	$Na_2B_4O_7.10H_2O$
25.0	1.131	21.926	»+$Na_2SO_4.10H_2O$	50.0	6.936	7.978	»
25.0	0.326	21.91	$Na_2SO_4.10H_2O$	50.0	5.116	21.171	»
25.0	0.0	21.90	»	50.0	4.760	25.482	»
30.0	3.75	0.0	$Na_2B_4O_7.10H_2O$	50.0	4.61	29.00	» +Na_2SO_4
30.0	1.27	28.78	»+$Na_2SO_4.10H_2O$	50.0	1.872	30.62	Na_2SO_4
				50.0	0.92	31.09	»
				50.0	0.0	31.9	»

Equilibrium in the System Sodium Tetraborate, Sodium Sulfate and Water (con.).

t°	Gms. per 100 gms. sat. sol. $Na_2B_4O_7$	Gms. per 100 gms. sat. sol. Na_2SO_4	Solid Phase.
55.0	12.37	0.0	$Na_2B_4O_7.10H_2O$
55.0	8.473	13.05	»
55.0	8.06	16.97	»+$Na_2B_4O_7.5H_2O$
55.0	7.884	17.646	$Na_2B_4O_7.5H_2O$
55.0	7.58	18.31	»
55.0	7.68	20.97	»
55.0	7.44	21.21	»
55.0	6.49	26.23	»
55.0	5.99	28.08	»+Na_2SO_4
55.0	0.0	31.575	Na_2SO_4
65.0	17.953	0.0	$Na_2B_4O_7.5H_2O$
65.0	16.10	3.71	»
65.0	15.98	3.94	»
65.0	10.46	17.08	»
65.0	7.90	26.47	»+Na_2SO_4
65.0	2.86	29.37	Na_2SO_4
80.0	23.9	0.0	$Na_2B_4O_7.5H_2O$
80.0	14.57	22.38	»+Na_2SO_4
102.9 b.pt.	37.07	0.0	$Na_2B_4O_7.5H_2O$
104	28.15	15.89	»+Na_2SO_4

In addition to the above results Sborgi and his associates give all other necessary data for constructing the space diagram of the system $Na_2B_4O_7 + (NH_4)_2SO_4 \rightleftharpoons (NH_4)_2B_4O_7 + Na_2SO_4$.

100 gms. 86.5 % glycerol ($d = 1.2326$ dissolve 89.0 gms. $Na_2B_4O_7.10H_2O$ at 20°.
» 98.5 % » ($d = 1.2645$ » 111.0 » »
(Holm, 1921, 1921 *a*, 1922.

SODIUM BROMIDE NaBr.

Solubility of Sodium Bromide in Absolute Ethyl Alcohol.
(Bonnell and Jones, 1926.)

The materials were carefully purified and especial attention paid to removal of traces of water from the alcohol. The mixtures were kept in a thermostat and shaken by hand at intervals during a long period. In some cases saturation was approached from above.

t°	Gms. NaBr per 100 gms. C_2H_5OH.	t°	Gms. NaBr per 100 gms. C_2H_5OH.	t°	Gms. NaBr per 100 gms. C_2H_5OH.
0.0	2.445	20.0	2.322	50.0	2.259
10.0	2.379	25.0	2.314	60.0	2.312
15.0	2.343	30.0	2.292	70.0	2.345
		40.0	2.276		

100 gms. 86.5 % glycerol ($d = 1.2326$) dissolve 44.7 gms. NaBr at 20°.
» 98.5 » ($d = 1.2645$) » 38.7 » »
(Holm, 1921, 1922.)

100 cc. sat. solution of sodium bromide in ethyl urethan contain 5.081 gms. NaBr at 60°. (Stuckgold, 1917.)

Fusion-point data for mixtures of NaBr + $SrBr_2$ are given by Kellner, 1917.

SODIUM CARBONATE $Na_2CO_3.10H_2O$.

SODIUM BICARBONATE $NaHCO_3$.

Equilibrium in the System Sodium Carbonate, Sodium Bicarbonate and Water.
(Freeth, 1922.)

Constant stirring was employed and the solid phases were identified by the Schreinemakers « rest method ».

Results at 0°. Gms. per 100 gms. sat. sol. Na_2CO_3.	$NaHCO_3$.	Results at 15°. Gms. per 100 gms. sat. sol. Na_2CO_3.	$NaHCO_3$.	Results at 20°. Gms. per 100 gms. sat. sol. Na_2CO_3.	$NaHCO_3$.	Solid Phase at Each Temperature.
6.4	0.0	14.1	0.0	18.0	0.0	$Na_2CO_3.10H_2O$
5.9	1.4	13.8	1.8	17.3	2.9	»
5.6	4.6	13.0	4.3	17.0	4.0	»+$NaHCO_3$
4.0	5.1	6.0	6.0	6.3	6.5	$NaHCO_3$
0.0	6.5	0.0	8.1	3.5	7.2	»
				0.0	8.7	»

Equilibrium in the System Sodium Carbonate, Sodium Bicarbonate and Water (con.).

(Freeth, 1922.)

t°.	Gms. per 100 gms. sat. sol. Na_2CO_3.	Gms. per 100 gms. sat. sol. $NaHCO_3$.	Solid Phase.
25....	22.7	0.0	$Na_2CO_3.10H_2O$
25....	22.6	1.5	»+I.I.2
25....	20.8	2.5	I.I.2
25....	17.9	4.0	»+$NaHCO_3$
25....	16.7	3.3	$NaHCO_3$
25....	10.0	3.9	»
25....	6.1	4.9	»
25....	0.0	9.3	»
30....	28.45	0.0	$Na_2CO_3.10H_2O$
30....	27.5	0.8	»
30....	27.1	1.3	»+I.I.2
30....	26.5	1.1	I.I.2
30....	26.1	1.2	»
30....	18.3	3.8	»
30....	17.6	4.3	»+$NaHCO_3$
30....	17.5	4.6	$NaHCO_3$
30....	9.7	6.3	»
30....	0.8	9.1	»
30....	0.0	9.9	»
35....	32.9	0.0	$Na_2CO_3.7H_2O$
35....	32.8	0.3	»
35....	32.5	0.6	»+I.I.2
35....	28.7	0.9	I.I.2
35....	23.7	2.0	»
35....	17.3	4.7	»+$NaHCO_3$
35....	9.7	6.7	$NaHCO_3$
35....	0.0	10.6	»
45....	32.2	0.0	$Na_2CO_3.H_2O$
45....	31.7	0.9	»+I.I.2
45....	27.3	1.3	I.I.2
45....	21.4	3.0	»
45....	16.9	5.9	»+$NaHCO_3$
45....	8.7	8.0	$NaHCO_3$
45....	0.8	11.3	»
45....	0.0	12.0	»
60....	31.8	0.0	$Na_2CO_3.H_2O$
60....	30.7	1.3	»+I.I.2
60....	25.8	2.4	I.I.2
60....	16.9	7.4	»+$NaHCO_3$
60....	8.5	10.1	$NaHCO_3$
60....	1.4	12.9	»

I.I.2 = $Na_2CO_3.NaHCO_3.2H_2O$

Equilibrium in the System Sodium Carbonate, Sodium Chlorate and Water at 24°.2.

(Iljinsky, 1924.)

The solutions were actively shaken at constant temperature and the attainment of equilibrium controlled by successive determinations of density and by analyses. The Na_2CO_3 was determined by titration with 0.1 *n* H Cl. The chlorate, by boiling with excess of Mohr's salt and titrating with chromate (?).

d of sat. sol.	Gms. per 100 gms. H_2O. Na_2CO_3.	Gms. per 100 gms. H_2O. $NaClO_3$.	Solid Pase.
1.224	28.5	0.0	$Na_2CO_3.10H_2O$
1.236	26.8	5.2	»
1.250	25.9	10.7	»
1.274	24.7	16.1	»
1.277	25.1	16.4	»
1.293	24.3	20.7	»
1.299	24.3	22.6	»
1.381	24.5	45.1	»
1.383	24.65	46.2	»+$Na_2CO_3.7H_2O$
1.391	24.8	47.3	$Na_2CO_3.7H_2O$
1.386	24.8	47.5	»
1.404	23.7	53.2	»
1.410	23.8	54.1	»
–	23.2	58.5	»
1.425	23.9	60.6	»
1.421	23.3	61.6	»
1.425	23.0	61.9	»
1.436	22.5	66.2	»
1.433	22.0	66.3	$Na_2CO_3.7H_2O$
1.439	22.5	66.5	»
1.443	21.8	69.3	»
1.443	22.2	69.4	»
1.440	22.1	69.8	»
1.442	21.4	71.0	»+$NaClO_3$
1.444	20.7	71.8	$NaClO_3$
1.439	11.7	84.0	»
1.431	5.3	91.8	»
1.432	7.7	92.0	»
1.431	7.7	93.5	»
1.431	5.0	93.8	»
1.425	2.5	94.9	»
1.438	3.9	95.2	»
1.441	5.5	95.6	»
1.429	0.0	98.6	»
1.462	0.0	116.4	» (at 40°)
1.466	16.2	100.8	»+$Na_2CO_3.H_2O$(at 40°)

Equilibrium in the System Sodium Carbonate, Sodium Chloride and Water.

(Freeth, 1922.)

Saturation was secured by means of constant stirring in a thermostat.

Results at 0°.		Results at 15°.		Results at 20°.		
Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Solid Phase. at Each Temperature.
Na_2CO_3.	NaCl.	Na_2CO_3.	NaCl.	Na_2CO_3.	NaCl.	
6.6	0.0	14.1	0.0	17.6	0.0	$NaCO_3.10H_2O$
4.3	4.5	9.9	9.9	15.5	4.0	»
3.7	8.2	8.7	14.7	14.1	7.7	»
3.1	12.3	–	–	12.9	12.8	»
2.9	15.6	– (10.6)	– (7.2)	–	–	»
2.8	20.4	– (10.2)	– (13.7)	–	–	»
2.8 (3.16)	24.2 (25.5)	9.2 (9.6)	20.2 (20.4)	13.5	17.4	»+NaCl
0.0	26.3	3.5 (3.1)	24.0 (24.3)	6.9	22.0	NaCl
		0.0	26.3	9.5	20.3	»
				11.5	18.9	»
				0.0	26.4	»

The results in parentheses are by Mondain-Monval, 1922.

	Gms. per 100 gms. sat. sol.				Gms. per 100 gms. sat. sol.		
t°.	Na_2CO_3.	NaCl.	Solid Phase.	t°.	Na_2CO_3.	NaCl.	Solid Phase.
25....	22.7	0.0	$Na_2CO_3.10H_2O$	35...	32.9	0.0	$Na_2CO_3.7H_2O$
25....	19.6	5.6	»	35...	31.5	2.0	»
25....	18.8	10.8	»	35...	31.0	2.5	»+$Na_2CO_3.H_2O$
25....	19.0	11.8	»+$Na_2CO_3.7H_2O$	35...	30.2	2.9	$Na_2CO_3.H_2O$
25....	18.4	13.0	$Na_2CO_3.7H_2O$	35...	25.5	7.1	»
25....	17.3	15.5	»+NaCl	35...	16.8	16.1	»+NaCl
25....	7.9	21.3	NaCl	35...	7.4	21.7	NaCl
25....	0.0	26.4	»	35...	4.0	24.0	»
30....	28.5	0.0	$Na_2CO_3.10H_2O$	40...	32.2	0.0	$Na_2CO_3.H_2O$
30....	27.0	3.7	»	40...	28.2	3.9	»
30....	26.9	3.9	»+$Na_2CO_3.7H_2O$	40...	24.4	7.3	»
30....	26.6	4.2	$Na_2CO_3.7H_2O$	40...	20.7	11.1	»
30....	24.6	7.2	»	40...	17.6	14.6	»
30....	22.7	9.3	»	40...	15.0	17.4	»+NaCl
30....	22.5	10.2	»+$Na_2CO_3.H_2O$	40...	10.3	20.2	NaCl
30....	21.9	10.4	$Na_2CO_3.H_2O$	40...	3.6	24.2	»
30....	20.5	11.1	»	60...	31.8	0.0	$Na_2CO_3.H_2O$
30....	21.2	12.9	$Na_2CO_3.7H_2O$+NaCl	60...	24.0	7.2	»
30....	17.7	15.0	$Na_2CO_3.H_2O$+NaCl	60...	20.2	10.9	»
30....	5.0	22.7	NaCl	60...	16.6	14.5	»
30....	0.0	26.5	»	60...	13.9	17.8	»+NaCl

Equilibrium in the System Sodium Bicarbonate, Sodium Chloride and Water.

(Freeth, 1922.)

Results at 0°.		Results at 15°.		Results at 20°.		Results at 25°.		
Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Solid Phase at Each Temp.
$NaHCO_3$.	NaCl.	$NaHCO_3$.	NaCl.	$NaHCO_3$.	NaCl.	$NaHCO_3$.	NaCl.	
6.5	0.0	8.1	0.0	8.7	0.0	9.3	0.0	$NaHCO_3$
2.7	8.8	3.8	8.6	4.2	8.5	3.2	12.7	»
1.1	19.8	2.0	16.4	1.7	19.5	1.8	19.7	»
0.6	25.9	0.9 (0.77)	26.1 (26.1)	1.0	26.1	1.2	26.0	»+NaCl

The results in parentheses are by Toporescu, 1922.

Equilibrium in the System Sodium Bicarbonate, Sodium Chloride and Water (con.). (Freeth, 1922.)

Results at 30°.		Result at 35°.		Result at 45°.		Result at 60°.		
Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		
$NaHCO_3$.	NaCl.	$NaHCO_3$.	NaCl.	$NaHCO_3$.	NaCl.	$NaHCO_3$.	NaCl.	Solid Phase at Each Temp.
9.9	0.0	10.6	0.0	12.0	0.0	14.1	0.0	$NaHCO_3$
4.9	8.8	4.7	10.3	5.8	10.5	7.4	10.0	»
1.9	19.5	2.1	19.6	2.7	19.2	5.7	19.1	»
1.2	26.1	1.3	26.2	1.5	26.2	2.2	26.4	»+NaCl

Equilibrium in the System Sodium Carbonate, Sodium Hydroxide and Water. (Freeth, 1922.)

Saturation was secured by constant stirring in a thermostat. For the strong sodium hydroxide solutions silver bottles provided with mercury-sealed rotating stirrers were used. The composition of the solid phases was determined by the Schreinemakers « rest method ». CO_2 was determined gravimetrically by absorption in K OH, Cl by the Volhard silver nitrate titration and sodium hydroxide by titration with standard sulfuric acid solution.

	Gms. per 100 gms. sat. sol.				Gms. per 100 gms. sat. sol.		
t°.	Na_2CO_3.	NaOH.	Solid Phase.	t°.	Na_2CO_3.	NaOH.	Solid Phase.
0...	6.4	0.0	$Na_2CO_3.10H_2O$	20...	0.3	39.8	$Na_2CO_3.H_2O$
0...	2.6	8.1	»	20...	0.3	41.5	» + Na_2CO_3
0...	2.2	18.4	»	20...	5.4	43.9*	Na_2CO_3
0...	2.7	20.9	»	20...	9.6	43.8*	»
0...	3.1	22.3	»+$Na_2CO_3.7H_2O$	20...	0.0	52.1	$NaOH.H_2O$
0...	3.1	23.0	$Na_2CO_3.7H_2O$ +$Na_2CO_3.H_2O$	25...	22.7	0.0	$Na_2CO_3.10H_2O$
				25...	18.2	5.4	»
0...	1.2	28.9	$Na_2CO_3.H_2O$	25...	18.1	7.0	»
0...	0.0	29.6	$NaOH.4H_2O$	25...	18.0	9.3	»+$Na_2CO_3.7H_2O$
15...	14.1	0.0	$Na_2CO_3.10H_2O$	25...	21.0	5.8**	$Na_2CO_3.7H_2O$
15...	10.1	4.8	»	25...	17.6	9.7	»
15...	7.5	13.8	»	25...	16.7	10.7	»
15...	8.9	17.0	»+$Na_2CO_3.7H_2O$	25...	15.4	12.7	»+$Na_2CO_3.H_2O$
15...	7.7	19.3	$Na_2CO_3.7H_2O$	25...	1.2	30.6	$Na_2CO_3.H_2O$
15...	7.9	19.4	»+$Na_2CO_3.H_2O$	25...	0.5	37.5	»
15...	6.3	20.8	$Na_2CO_3.H_2O$	25...	0.5	42.4	» + Na_2CO_3
15...	4.1	23.9	»	25...	4.5	47.1*	Na_2CO_3
15...	1.2	30.6	»	25...	0.0	53.3	$NaOH.H_2O$
15...	0.2	44.9	»	30...	28.4	0.0	$Na_2CO_3.10H_2O$
15...	0.6	47.3	» + Na_2CO_3	30...	26.5	3.1	»
15...	0.7	49.8	Na_2CO_3	30...	26.7	3.5	»+$Na_2CO_3.7H_2O$
15...	0.0	51.2	$NaOH.H_2O$	30...	25.7	4.0	$Na_2CO_3.7H_2O$
15...	0.0	37.5	$NaOH.3\,1/2\,H_2O$	30...	24.3	5.5	»
15...	0.0	41.5	»	30...	21.9	7.9	»+$Na_2CO_3.H_2O$
20...	18.0	0.0	$Na_2CO_3.10H_2O$	30...	19.0	9.8	$Na_2CO_3.H_2O$
20...	12.9	6.3	»	30...	13.7	13.8	»
20...	11.6	12.7	»	30...	0.9	31.2	»
20...	12.4	13.4	»+$Na_2CO_3.7H_2O$	30...	15.1	35.0*	» + Na_2CO_3
20...	11.7	14.7	$Na_2CO_3.7H_2O$	30...	0.5	41.6	» »
20...	11.1	16.2	»+$Na_2CO_3.H_2O$	30...	2.5	44.5*	Na_2CO_3
20...	5.2	22.0	$Na_2CO_3.H_2O$	30...	6.1	49.1*	»
20...	1.1	29.7	»	30...	0.0	54.3	$NaOH.H_2O$

*This solution was not clear. **Supersaturated solution.

Equilibrium in the System Sodium Carbonate, Sodium Hydroxide and Water. (con.). (Freeth, 1922.)

t°.	Gms. per 100 gms. sat. sol. Na_2CO_3.	NaOH.	Solid Phase.
35...	32.9	0.0	$Na_2CO_3.7H_2O$
35...	32.0	0.6	» $+Na_2CO_3H_2O$
35...	25.3	4.9	$Na_2CO_3.H_2O$
35...	15.2	11.9	»
35...	7.5	18.7	»
35...	1.9	27.5	»
35...	0.5	34.2	»
35...	0.5	39.2	» $+Na_2CO_3$
35...	0.2	39.5	Na_2CO_3
35...	0.2	44.8	»
35...	0.2	50.2	»
35...	0.0	55.4	$NaOH.H_2O$
45...	32.2	0.0	$Na_2CO_3H_2O$
45...	14.5	12.1	»
45...	1.4	28.1	»
45...	0.5	37.8	$Na_2CO_3.H_2O$
45...	0.5	38.3	» $+Na_2CO_3$
45...	0.5	47.0	Na_2CO_3
45...	0.2	52.4	»
45...	0.0	57.8	$NaOH.H_2O$
60...	31.8	0.0	$Na_2CO_3.H_2O$
60...	22.5	6.1	»
60...	14.2	12.2	»
60...	6.9	19.4	»
60...	1.1	32.6	»
60...	0.8	34.4	» $+Na_2CO_3$
60...	0.7	35.4	Na_2CO_3
60...	0.3	42.3	»
60...	0.3	52.2	»
60...	0.0	63.5	$NaOH.H_2O$

Equilibrium in the System Sodium Carbonate, Sodium Bicarbonate, Sodium Chloride and Water at Various Temperatures. (Freeth, 1922.)

Na 10 = $Na_2CO_3.10H_2O$; Na 7 = $Na_2CO_3.7H_2O$; Na 1 = $Na_2CO_3.H_2O$; NaH = $NaHCO_3$; 1.1.2 = $Na_2CO_3.NaHCO_3.2H_2O$ (sodium sesquicarbonate).

Gms. per 100 gms. sat. sol. Na_2CO_3.	$NaHCO_3$.	NaCl.	Solid Phase.
Results at 0°.			
3.78	3.51	4.81	Na 10 + NaH
2.89	2.83	9.53	»
2.39	2.14	15.14	»
2.63	0.92	21.32	»
2.77	1.11	22.84	» +1.1.2
2.99	0.73	23.86	Na 10 + NaCl + »
2.72	0.96	23.88	NaH + NaCl + »
2.77	0.92	23.86	» »
1.30	0.73	25.05	» »
Results at 15°.			
11.42	4.05	3.06	Na 10 + NaH
9.62	2.33	7.71	»
9.74	1.41	11.19	» +1.1.2
9.33	2.06	11.58	» »
4.80	1.91	18.52	NaH + 1.1.2
8.48	1.38	15.24	Na 10 + 1.1.2
9.11	0.19	20.49	Na 10 + 1.1.2 + NaCl
6.41	0.08	22.18	» »
4.70	0.31	23.22	» »
3.25	0.61	23.93	NaH + 1.1.2 + NaCl
Results at 20°.			
16.17	3.40	2.22	Na 10 + NaH + 1.1.2
13.40	2.60	7.90	Na 10 + 1.1.2
12.58	1.07	13.97	»
13.40	0.61	17.54	Na 10 + 1.1.2 + NaCl
8.48	0.69	20.50	1.1.2 + NaCl
5.35	0.84	22.38	»
14.60	3.51	3.87	1.1.2 + NaH
12.70	3.09	6.03	»
11.52	2.86	7.64	»
6.99	2.83	13.43	»
2.60	1.53	23.74	1.1.2 + NaH + NaCl
Results at 25°.			
19.84	1.34	5.01	Na 10 + 1.1.2
18.99	0.76	11.09	»
18.99	0.80	11.38	Na 10 + 1.1.2 + Na 7
18.36	0.53	12.84	1.1.2 + Na 7
17.28	0.34	15.28	1.1.2 + Na 7 + NaCl
13.28	0.61	17.72	1.1.2 + NaCl
7.28	0.53	21.35	»
11.35	2.90	7.57	1.1.2 + NaH
6.65	1.95	15.04	»
2.55	1.38	23.97	» + NaCl

EQUILIBRIUM IN THE SYSTEM SODIUM CARBONATE, SODIUM BICARBONATE, SODIUM CHLORIDE AND WATER AT VARIOUS TEMPERATURES (CON.). (Freeth, 1922.)

Gms. per 100 gms. sat. sol. Na_2CO_3	$NaHCO_3$	NaCl	Solid Phase
Results at 30°.			
26.61	0.99	3.65	I.I.2+Na10+Na7
22.63	0.61	9.88	» +Na1 + »
17.79	0.53	14.88	» + » +NaCl
13.20	0.99	17.69	» +NaCl
7.33	0.96	21.30	» »
11.21	3.32	7.70	» +NaH
6.70	2.25	14.96	» »
25.3	1.68	24.01	» » +NaCl
Results at 35°.			
21.96	0.12	8.30	I.I.2+Na1
18.46	0.11	12.08	» »
30.27	0.57	1.97	» » +Na7
17.04	0.61	15.52	» » +NaCl
13.23	0.57	17.85	» +NaCl
7.42	0.61	21.41	» »
11.57	3.59	7.61	» +NaH
6.72	2.56	14.85	» »
5.52	2.10	16.97	» »
3.25	0.76	23.75	» » +NaCl
3.01	1.34	23.92	» » »

Gms. per 100 gms. sat. sol. Na_2CO_3	$NaHCO_3$	NaCl	Solid Phase
Results at 45°.			
23.35	1 03	7.84	I.I.2+Na1
18.97	0.50	12.62	» »
14.34	0.61	17.40	» » +NaCl
9.25	0.15	20.62	» +NaCl
6.84	0.50	21.98	» »
6.29	0.76	22.35	» »
4.29	1.11	23.43	» »
12.44	5.08	5.38	» +$NaHCO_3$
10.75	3.29	8.91	» »
6.94	2.52	14.70	» »
3.04	1.99	23.91	» » +NaCl
Results at 60°.			
25.59	1.57	4.73	I.I.2+Na1
18 87	0.80	11.94	» »
12.39	0.53	19.13	» » +NaCl
10.75	0.73	20.06	» +NaCl
14.00	6.11	3.73	» +$NaHCO_3$
8.99	4.16	11.34	» »
3.45	1.83	23.88	» » +NaCl
3.11	2.56	24.37	» » »

EQUILIBRIUM IN THE SYSTEM SODIUM CARBONATE, SODIUM HYDROXIDE, SODIUM CHLORIDE AND WATER AT VARIOUS TEMPERATURES. (Freeth, 1922.)

Gms. per 100 gms. sat. sol. Na_2CO_3	NaOH.	NaCl.	Solid Phase.
Results at 0°.			
2 4	8.4	17.3	Na 10+NaCl
2.4	14.3	12.7	» »
2.8	16.0	11.2	» » +Na7
2.9	20.5	4.2	» +Na7
2.9	19.9	8.5	Na 1 + » +NaCl
3.4	22.1	4.2	» »
2.2	25.1	6.9	» +NaCl
1.9	23.0	6.5	» »
1.2	25.8	5.6	» »
0.6	29.2	4.3	« »
Results at 15°.			
9.2	1.5	19.4	Na 10+NaCl
8.4	5.8	16.2	» »
8.7	7.2	14.9	» » +Na7
7.9	10.4	10.5	» +Na7
8.7	15.6	2.4	» »
7.5	10.6	12.7	NaCl+ »
7.2	12.5	11.7	» » +Na1
8.2	13.6	9.6	Na7 + Na1
7.9	17.7	3.1	» »
1.9	23.1	7.4	NaCl+ »
0.2	46.2	0.9	» »

Gms. per 100 gms. sat. sol. Na_2CO_3	NaOH.	NaCl.	Solid Phase.
Results at 20°.			
12.8	1.7	16.9	Na10+Na7+NaC.
11.6	9.5	6.9	» »
12.0	3.6	15.9	NaCl+ »
9.6	8.5	13.4	» »
9.6	9.7	12.4	» » +Na1
10.1	12.4	7.5	Na1+ »
10.6	15.5	1.9	» »
7.0	12.3	11.9	» +NaCl
1.2	25.1	6.6	» »
1.7	46.7	0.9	» »
Results at 25°.			
18.1	1.7	8.6	Na10+Na7
18.3	6.3	3.3	» »
15.9	1.7	15.0	NaCl+ »
14.9	8.6	6.4	Na1 + »
15.2	11.0	3.2	» + »
13.5	4.4	14.1	» + » +NaCl
9.1	8.9	13.5	» +NaCl
3.1	18.5	9.9	» »
0.3	41.5	1.5	» »
0.3	44.0	1.3	» »
0.5	45.7	1.1	» »+Na_2CO_3
0.2	49.9	1.0	NaCl+Na_2CO_3

Equilibrium in the System Sodium Carbonate, Sodium Hydroxide, Sodium Chloride and Water at Various Temperatures (con.).

(Freeth, 1922.)

Gms. per 100 gms. sat. sol. Na_2CO_3.	NaOH.	NaCl.	Solid Phase.	Gms. per 100 gms. sat. sol. Na_2CO_3.	NaOH.	NaCl.	Solid Phase.
Results at 30°.				Results at 45°.			
26.7	2.2	1.2	Na 10 + Na 7	9.2	6.1	16.7	Na 1 + NaCl
23.1	1.5	7.6	Na 1 + »	2.9	18.1	10.8	» »
22.4	5.2	2.9	» »	0.4	33.4	3.8	» »
6.0	12.4	12.5	» + NaCl	0.3	37.2	2.7	» + Na_2CO_3
0.2	34.6	3.0	» + »	0.3	38.8	2.4	Na_2CO_3 + NaCl
0.2	41.8	1.5	» + » + Na_2CO_3	0.2	40.4	2.1	» »
0.2	51.3	1.0	Na_2CO_3 + NaCl	0.5	54.1	1.3	» »
Results at 35°.				Results at 60°.			
11.0	5.4	15.3	Na 1 + NaCl	5.8	9.4	15.8	Na 1 + NaCl
4.6	14.7	11.8	» »	2.6	18.1	11.3	» »
1.4	24.9	7.0	» »	1.7	22.3	8.4	» »
0.3	40.8	1.8	» + Na_2CO_3	0.5	33.2	4.3	» + Na_2CO_3
1.0	49.0	1.2	Na_2CO_3 + NaCl	0.2	52.6	1.7	Na_2CO_3 + NaCl

The following temperatures of the fixed points were determined.

Solid Phases in Contact with Solution.

t°.		t°.	
21.0.....	Na 10 + NaCl + Na 7	31.0.....	Na 10 + Na 7 + 1.1.2
26.2.....	Na 7 + NaCl + Na 1	34..5.....	Na 7 + Na 1 + 1.1.2
19.7.....	Na 10 + NaH + 1.1.2		

Na 10 = $Na_2CO_3.10H_2O$; Na 7 = $Na_2CO_3.7H_2O$; Na 1 = $Na_2CO_3.H_2O$; NaH = $NaHCO_3$; 1.1.2 = $Na_2CO_3.NaHCO_3.2H_2O$ (sodium sesqui carbonate).

Equilibrium in the System Sodium Carbonate, Sodium Sulfate and Water at Various Temperatures. (Caspari, 1924.)

The mixtures were constantly rotated in a thermostat. Since the branches of the isotherms were nearly straight lines data are given only for the end points corresponding to the intersections.

S 10 = $Na_2SO_4.10H_2O$; C 10 = $Na_2CO_3.10H_2O$; C 7 = $Na_2CO_3.7H_2O$; C 1 = $Na_2CO_3.H_2O$; 1.2 = $Na_2CO_3.2Na_2SO_4$.

t°.	Gms. per 100 gms. sat. sol. Na_2CO_3.	Na_2SO_4.	Solid Phase.	t°.	Gms. per 100 gms. sat. sol. Na_2CO_3.	Na_2SO_4.	Solid Phase.
- 2.45..	5.21	2.06	C 10 + S 10 + Ice	30.0...	10.2	25.1	S 10 + Na_2SO_4
- 2.1...	5.75	0.0	C 10 + Ice	30.0...	0.0	29.3	»
15.0...	14.1	0.0	C 10	35.0...	33.0	0.0	C 7
15.0...	12.3	8.0	» + S 10	35.0...	30.0	5.7	» + 1.2
15.0...	0 0	11.8	S 10	35.0...	14.3	20.6	1.2 + Na_2SO_4
20.0...	17.75	0.0	C 10	35.0...	0.0	33.15	Na_2SO_4
20.0...	14.95	11.2	« + S 10	50.0...	32.2	0.0	C 1
20.0...	0.0	16.25	S 10	50.0...	29.7	5.5	» + 1.2
25.0...	22.6	0.0	C 10	50.0...	11.4	22.2	1.2 + Na_2SO_4
25.0...	17.9	16.2	» + S 10	50.0...	0.0	31.8	Na_2SO_4
25.0 ..	0.0	21.9	S 10	75.0...	31.45	0.0	C 1
30.0 ..	27.15	0.0	C 10	75.0...	29.0	4.8	» + 1.2
30.0...	25.8	8.6	» + 1.2	75.0...	7 6	24.2	1.2 + Na_2SO_4
30.0...	15.5	19.5	1.2 + Na_2SO_4	75.0...	0.0	30.4	Na_2SO_4

Equilibrium in the System Sodium Carbonate, Sodium Sulfate and Water at 19°.1 and 50°. (Dawkins, 1922.)

The mixtures were constantly stirred in a thermostat. Both the saturated solutions and the undissolved residues were analyzed. The solid phase was mixed crystals in all cases.

	At 19°.1.				At 50°.			
	Gms. per 100 gms. sat. sol.		Gms. per 100 gms. undissolved residue.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. undissolved residue.	
d of sat. sol.	Na_2CO_3.	Na_2SO_4.	Na_2CO_3.	Na_2SO_4.	Na_2CO_3.	Na_2SO_4.	Na_2CO_3.	Na_2SO_4.
1.19	15.97	4.97	28.29	2.34	28.64	5.35	66.20	3.35
1.22	14.92	9.05	30.82	3.19	28.52	5.87	52.91	11.77
1.23	14.82	9.50	26.88	4.80	25.71	7.52	26.87	36.86
1.29	14.53	10.47	19.31	16.88	19.37	12.92	22.10	45.36
1.28	13.84	10.69	6.84	29.42	12.55	20.35	16.69	47.06
1.26	12.13	11.06	6.37	28.04	10.52	22.47	11.53	63.05
1.21	9.22	11.89	4.54	29.30	10.21	23.10	6.53	61.86
1.15	4.85	13.17	2.30	31.87	5.06	27.31	1.56	80.58

Equilibrium in the System Sodium Bicarbonate, Sodium Sulfate and Water.

Results at several temperatures. (Nishizawa, 1920.)

	Gm. mols. per 1000 gm. mols. H_2O.		
t°.	$NaHCO_3$.	Na_2SO_4.	Solid Phase.
15.0...	18.53	0.0	$NaHCO_3$
15.0...	12.75	14.18	»+$Na_2SO_4.10H_2O$
30.0...	23.61	0.0	$NaHCO_3$
30.0...	8.55	48.84	»+$Na_2SO_4.10H_2O$
40.0...	26.92	0.0	$NaHCO_3$
40.0...	9.45	57.14	»+$Na_2SO_4.10H_2O$

Results at 35°. (Fedoteiff and Kolosoff, 1923.)

	Gms. per 100 gms. H_2O.		
d of sat. sol.	$NaHCO_3$.	Na_2SO_4.	Solid Phase.
1.05...	11.66	0.0	$NaHCO_3$
1.13...	8.81	7.10	»
1.22...	5.67	17.38	»
1.31...	4.69	36.05	»
1.41...	3.65	46.31	» + Na_2SO_4

The following results are also given by Nishizawa, 1920, for solutions simultaneously saturated with sodium bicarbonate, sodium sulfate and the double salt, 1.1.4 = $Na_2SO_4.(NH_4)_2SO_4.4\,H_2O$.

	Gms. mols. per 1000 gms. mols. H_2O.			
t°.	$NaHCO_3$.	Na_2SO_4.	$(NH_4)_2SO_4$.	Solid Phase.
15.0.....	12.84	26.22	45.86	$NaHCO_3$ + $Na_2SO_4.10H_2O$ + 1.1.4
30.0.....	7.85	55.03	31.83	$NaHCO_3$ + Na_2SO_4 + 1.1.4
40.0.....	11.26	49.33	45.41	$NaHCO_3$ + Na_2SO_4 + 1.1.4

Solubility of Sodium Carbonate and of Sodium Bicarbonate (Each Separately) in Glycerol at 20°. (Holm, 1921, 1922.)

Solvent.	Gms. Na_2CO_3 per 100 gms. solvent.	Gms. $NaHCO_3$ per 100 gms. solvent.
86.5 % glycerol of d = 1.2326.....	108–123	4.05
98.5 % » » d = 1.2645.....	78–102	7.86

SODIUM CHLORATE $NaClO_3$.

Solubility of Sodium Chlorate in Water.

Results of Billiter, 1920.

t°.	Gms. $NaClO_3$ per 100 cc. sat. sol.	t°.	Gms. $NaClO_3$ per 100 cc. sat. sol.
20....	72.2	70....	96.0
30....	77.0	80....	100.2
40...	82.0	90....	106.0
50....	86.6	100....	111.0
60....	91.3		

Results of Bell, 1923.

t°.	Gms. $NaClO_3$ per 100 gms. sat. sol.	t°.	Gms. $NaClO_3$ per 100 gms. sat. sol.
0....	44.32	30....	51.30
10....	46.70	35....	52.38
20....	48 95	40....	53.54
25....	50.13	100....	67.10

Saturation was secured in both cases by constant agitation in a thermostat.

Solubility of Sodium Chlorate in Aqueous Solutions of Sodium Chloride. (Billiter, 1920.)

t°.	Gms. $NaClO_3$ per 100 cc. sat. solution in Aq. 10 % NaCl.	Aq. 20 % NaCl.	Aq. 32 % NaCl.
20	66	57.4	41.8
40	75	65	42
60	83.5	70	42.4
80	92	77	43.3
100	102	87	44

SODIUM Per CHLORATE $NaClO_4.H_2O$.

Solubility of Sodium Perchlorate in Water. (Freeth, 1924.)

Saturation was secured by constant agitation in a thermostat.

t°.	Gms. $NaClO_4$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $NaClO_4$ per 100 gms. sat. sol.	Solid Phase.
— 3.0	10.00	Ice	15.0	65.51	$NaClO_4.H_2O$
— 6.8	20	»	30.0	68.71	»
—11.1	30	»	40.0	70.88	»
—17.8	40	»	50.0	73.16	»
—22.0	45	»	50.8	73.3	» + $NaClO_4$
—32.0	56	Ice + $NaClO_4.H_2O$	60.0	74.3	$NaClO_4$
0.0	62.64	$NaClO_4.H_2O$	75.0	75.0	»

Equilibrium in the System Sodium Perchlorate, Sodium Sulfate and Water at 35° and at 60. (Freeth, 1924.)

Results at 25°. Gms. per 100 gms. sat. sol. $NaClO_4$.	Na_2SO_4.	Solid Phase.	Results at 60°. Gms. per 100 gms. sat. sol. $NaClO_4$.	Na_2SO_4.	Solid Phase.
67.60	0.0	$NaClO_4.H_2O$	74.30	0.0	$NaClO_4$
67.67	0.26	» + Na_2SO_4	74.40	0.29	» + Na_2SO_4
53.58	1.24	Na_2SO_4	64.65	0.37	Na_2SO_4
41.68	4.28	»	52.47	1.11	»
31.24	9.07	Na_2SO_4 + $Na_2SO_4.10H_2O$	31.55	6.95	»
18.72	12.56	$Na_2SO_4.10H_2O$	17.70	14.90	»
5.79	18.15	»	0.0	31.20	»
0.0	21.71	»			

The author also gives complete data for the quarternary equilibria in the system $NaClO_4 + (NH_4)_2SO_4 + NH_4ClO_4 + Na_2SO_4 + H_2O$ at 25° and at 60°.

Solubility of Anhydrous Sodium Perchlorate in Several Solvents at 25°. (Willard and Smith, 1923.)

Solvent.	$d_{\frac{25}{4}}$ of sat. sol.	Gms. $NaClO_4$ per 100 gms. sat. sol.	Solvent.	$d_{\frac{25}{4}}$ of sat. sol.	Gms. $NaClO_4$ per 100 gms. sat. sol.
Water	1.6821	67.70	*n* Butyl alcohol	0.8167	1.83
Methyl alcohol	1.0561	33.93	*iso* »	0.8031	0.78
Ethyl alcohol	0.8685	12.82	Acetone	1.0732	34.10
n Propyl alcohol	0.8308	4.66	Ethyl acetate	0.9574	8.80

Solubility of Sodium Perchlorate in Normal Butyl Alcohol Containing Increasing Percentages of Perchloric Acid at 25° ± 3°.0 and at the Boiling-Point. (Smith, 1923 *a*.)

The results are given only in the form of a diagram, from which the following approximate values were read.

Gms. $HClO_4.2H_2O$ per 100 gms. solvent.	Gms. $NaClO_4$ per 100 gms. sat. sol. at 25°±3°.0.	b. pt.	Gms. $HClO_4.2H_2O$ per 100 gms. solvent.	Gms. $NaClO_4$ per 100 gms. sat. sol. at 25°±3°.0.	b. pt.
0.0 (=n-butyl alc.)	2.8	7.5	0.6	3.05	8.2
0.2	2.9	7.8	0.8	3.0	8.35
0.4	3.0	8.0	1.0	2.8	9.0

SOLUBILITY OF ANHYDROUS SODIUM PERCHLORATE IN MIXTURES OF ETHYL ACETATE AND ALCOHOLS AT 25° ± 0°.1. (Smith, 1925.)

Volume % alcohol in solvent.	Gms. $NaClO_4$ per 100 gms. sat. sol. in solvent composed of ethyl acetate and Methyl alcohol.	Ethyl alcohol.	93% Ethyl alcohol.	*n* Butyl alcohol.	*n* Butyl* alcohol.	Ethyl** alcohol.
0.0 (=Ethyl acetate.	8.8	8.8	8.8	8.8	8.8	26.32
5.0	—	13.83	14.12	—	11.97	—
10.0	19.39	16.05	16.92	12.34	13.00	29.32
20.0	23.37	18.55	20.00	13.16	14.32	31.16
30.0	25.85	19.66	21.75	—	14.75	32.44
40.0	27.81	20.08	22.79	12.82	14.71	33.26
50.0	29.38	20.07	23.30	11.99	13.98	33.63
60.0	30.50	19.67	23.39	10.54	13.09	33.61
70.0	31.61	18.78	22.73	—	11.66	33.20
80.0	32.56	17.53	21.92	6.70	9.85	32.56
90.0	33.44	15.82	20.96	4.35	7.87	31.56
95.0	—	14.80	21.31	—	6.97	31.10
100.0	34.33	12.87	20.60	2.19	4.27	29.80

* A different sample of *n* Butyl alcohol of $d_{25} = 0.8065$ and b. pt. 112°-118°.

** The solid phase in this case was $NaClO_4.H_2O$ instead of the anhydrous salt.

SODIUM CHLORIDE NaCl.

THE ICE CURVE FOR AQUEOUS SOLUTIONS OF SODIUM CHLORIDE. (Rodebush, 1918.)

The temperatures were measured with a thermoelement and the concentrations determined by conductivity.

t° of f. pt.	Gms. NaCl per 100 gms. H_2O.	t° of f. pt.	Gms. NaCl per 100 gms. H_2O	t° of f. pt.	Gms. NaCl per 100 gms H_2O
—3.48	6.11	— 9.41	15.46	—16.21	24.75
—5 17	8.92	—11.04	17.87	—18.73	27.70
—6.32	10.77	—14.33	22.25	—20.56	29.70
—8.52	14.20	—14.77	22.99	—21.12 Eutec.	30.40

Similar determinations by Klein and Svanberg, 1920, gave the following results.

t° of f. pt.	—0.340.	—0.853.	—1.688.
Normality of aq. NaCl	0.1	0.25	0.5

SOLUBILITY OF SODIUM CHLORIDE IN AQUEOUS SOLUTIONS OF SODIUM DICHROMATE. (Robertson, 1924.)

The mixtures of salts were dissoved in water at a temperature higher than that of the experiment and the flasks then placed in a thermostat. Constant agitation is not mentioned.

Results at 25°. Gms. per 100 gms. sat. sol.		Results at 50°. Gms. per 100 gms. sat. sol.		Results at 100°. Gms. per 100 gms. sat. sol.		Solid Phase at Each Temperature.
NaCl.	$Na_2Cr_2O_7$.	NaCl.	$Na_2Cr_2O_7$.	NaCl.	$Na_2Cr_2O_7$.	
24.0	5.18	24.2	5.87	25.1	6.28	NaCl
21.0	11.7	20.8	13.0	18.3	20.0	»
18.0	17.8	19.1	16.4	15.4	26.5	»
15.4	23.8	15.8	23.1	11.7	34.9	»
13.3	28.8	13.1	29.4	9.06	41.1	»
10.7	35.0	11.1	34.3	5.59	50.9	»
8.8	39.3	8.43	41.3	4.14	55.4	»
6.61	45.1	4.57	52.3	2.66	62.3	»
4.67	50.6	2.71	58.1	1.64	68.6	»
3.10	57.1	1.94	63.4	1.22	71.9	»
1.13	64.6	0.94	70.2	0.74	80.0	»+$Na_2Cr_2O_7.2H_2O$
0.0	65.5	0.0	70.3	0.0	80.1	$Na_2Cr_2O_7.2HO$*

* $Na_2Cr_2O_7$ at 100°.

Data for the 4 component system (K, Na) — (Cl, Cr_2O_7) — H_2O are also given.

Solubility of Sodium Chloride in Aqueous Solutions of Sodium Hydroxide at Various Temperatures. (von Antropoff, 1924.)

Constant agitation was employed and equilibrium was approached from above and from below. Silver lined apparatus was used and the determinations were made with the greatest care. The results for 16 isotherms were plotted and the dissolved sodium chloride, and specific gravities of the solutions corresponding to regular intervals of concentration of sodium hydroxide, were read from the curves. The figures in parentheses are the specific gravities of the saturated solutions.

Gms. NaOH per 100 gms. sat. sol.	Gms. Na Cl dissolved per 100 gms. sat. solution at						
	− 21.3°.	− 11°.1.	0°.	+ 10°	20°	30°.	40°.
5...	20.1(1.2333)	21.0(1.229)	21.9(1.232)	22.0(1.227)	22.1(1.223)	22.2(1.218)	22.3(1.218)
10...	16.9(1.260)	17.5(1.259)	17.8(1.254)	17.9(1.250)	18.0(1.243)	18.1(1.243)	18.2(1.241)
15...	13.7(1.287)	13.9(1.286)	14.1(1.279)	14.2(1.276)	14.3(1.270)	14.4(1.271)	14.5(1.269)
20...	10.3(1.318)	10.4(1.313)	10.5(1.308)	10.6(1.306)	10.7(1.298)	10.8(1.297)	10.9(1.296)
25...	7.0(1.350)	7.1(1.342)	7.2(1.337)	7.3(1.334)	7.4(1.330)	7.5(1.329)	7.7(1.326)
30...	—	—	4.3(1.373)	4.5(1.370)	4.7(1.368)	4.9(1.363)	5.0(1.359)
35...	—	—	2.2(1.415)	2.5(1.412)	2.8(1.406)	3.0(1.400)	3.1(1.398)
40...	—	—	—	1.3(1.453)	1.6(1.446)	1.8(1.441)	2.0(1.438)
45...	—	—	—	0.9(1.501)	1.1(1.490)	1.3(1.484)	1.5(1.480)
50...	—	—	—	—	0.8(1.540)	1.0(1.530)	1.2(1.525)
55...	—	—	—	—	—	—	1.0(1.574)

Gms. NaOH per 100 gms. sat. sol.	Grams Na Cl dissolved per 100 gms. sat. solution at						
	50°.	60°.	70°.	80°.	90°.	120°.	150°.	180°.
5...	22.4(1.213)	22.8(1.211)	23.0(1.209)	23.4(1.205)	23.7(1.200)	24.6	25.6	27.0
10...	18.3(1.237)	18.7(1.236)	19.0(1.231)	19.3(1.229)	19.6(1.224)	20.4	21.8	23.0
15...	14.7(1.264)	14.9(1.262)	15.0(1.258)	15.5(1.256)	15.8(1.254)	16.8	18.0	19.6
20...	11.1(1.292)	11.4(1.290)	11.7(1.288)	12.1(1.287)	12.4(1.284)	13.3	15.0	16.3
25...	8.0(1.323)	8.4(1.322)	8.6(1.320)	9.1(1.320)	9.5(1.318)	10.5	12.1	13.8
30...	5.3(1.357)	5.8(1.360)	6.0(1.355)	6.6(1.356)	7.1(1.352)	8.2	10.0	11.8
35...	3.4(1.394)	3.9(1.400)	4.1(1.393)	4.7(1.397)	5.2(1.390)	6.5	8.3	10.0
40...	2.3(1.434)	2.7(1.437)	3.0(1.432)	3.5(1.435)	3.9(1.428)	5.2	7.0	8.9
45...	1.8(1.474)	2.0(1.472)	2.3(1.474)	2.7(1.472)	3.0(1.465)	4.4	6.1	8.0
50...	1.5(1.517)	1.7(1.515)	2.0(1.512)	2.4(1.510)	2.7(1.508)	3.8	5.6	7.7
55...	1.3(1.566)	1.7(1.563)	2.0(1.561)	2.3(1.560)	2.6(1.558)	3.6	5.4	7.4
60...	—	1.7(1.610)	2.1(1.610)	2.4(1.609)	2.7(1.608)	3.8	5.7	7.7
65...	—	2.2	—	2.6	2.9(1.650)	4.1	6.0	7.9
70...	—	2.4	—	2.8	3.2(1.70)	4.5	6.5	8.1
75...	—	—	—	—	—	—	—	8.5

Results in close agreement with the above at 0°, 15°, 20°, 25°, 30°, 35°, 45° and 60° are given by Freeth, 1922.

Solubility of Sodium Chloride in Aqueous Solutions of Sodium Hydroxide at the Boiling-Point. (von Antropoff, 1924.)

t° of B. pt.	d of sat. sol.	Gms. per 100 gms. sat. sol. Na Cl.	Na OH.	t° of B. pt.	d of sat. sol.	Gms. per 100 gms. sat. sol Na Cl.	Na OH.
108.8...	1.172	28.9	0.0	123.0...	1.346	8.7	30.0
110.0...	1.195	24.8	5.0	128.7...	1.381	7.4	35.0
111.5...	1.222	20.9	10.0	135.0...	1.416	6.5	40.0
113.3...	1.250	17.1	15.0	141.7...	1.452	5.9	45.0
115.4...	1.279	13.8	20.0	150.0...	1.487	5.6	50.0
118.4...	1.312	10.8	25.0	160.5...	1.522	5.9	55.0

EUTECTIC POINTS OF THE SYSTEM SODIUM CHLORIDE, SODIUM HYDROXIDE AND WATER, (von Antropoff, 1924.)

Eutec. t°.	Gms. per 100 gms. sat. sol. NaCl.	NaOH.	Solid Phase.
−30.15.	16.55	8.87	Ice+NaCl.2H_2O
−21.30.	23.6	—	» + »
−32.8..	8.58	18.38	» + »+NaOH.γH_2O
−29.8..	4.20	20.72	» +NaOH.γH_2O
−28.25.	—	19.00	» »
−28.00.	—	22.55	» »
−21.3..	6.02	26.04	NaCl+NaOH.βH_2O(?)
−11.1..	5.89	27.08	» »
0.0..	4.85	29.06	» +NaOH.3.5H_2O
10.0..	3.24	33,24	» » »
0.0..	1.83	36.98	» » 3.11 »*
10.0..	0.87	47.19	» +NaOH.2H_2O

Eutec. t°.	Gms. per 100 gms. sat. sol. NaCl.	NaOH.	Solid Phase.
20..	0.78	51.07	NaCl+NaOHH_2O
30..	0.85	53.09	» »
40..	0.98	55.11	» »
50..	1.28	57.58	» »
60..	1.70	62.64	» »
70..	2.40	70.40	» +NaOH
80..	2.95	72.16	» »
90..	3.45	72.73	» »
120..	4.86	73.39	» »
150..	7.02	74.10	» »
180..	8.75	76.05	» »

* Unstable.

Additional data for this system are given by von Antropoff and Sommer, 1926

SOLUBILITY OF SODIUM CHLORIDE IN AQUEOUS SOLUTIONS OF SODIUM NITRATE AND VICE VERSA AT SEVERAL TEMPERATURES. (Cornec and Chretien, 1924.)

d of sat. sol.	Gms. per 100 gms. sat. sol. NaCl.	$NaNO_3$.	Solid Phase.
Results at 0°.			
1.209	26.4	0.0	NaCl
1.251	23.2	8.0	»
1.290	20.0	15.6	»
1.332	17.0	23.2	» +$NaNO_3$
1.332	12.2	28.0	$NaNO_3$
1.333	9.48	30.9	»
1.352	0.0	42.3	»
Results at 25°.			
1.198	26.6	0.0	NaCl
1.245	22.6	9.7	»
1.290	18.9	18.4	»
1.329	15.9	25.5	»
1.367	13.3	32 1	» +$NaNO_3$
1.371	9.58	36.0	$NaNO_3$
1.376	6.23	40.5	»
1.386	3.16	43.7	»
1.392	0.0	47.8	»
Results at 50°.			
1.185	26.9	0.0	NaCl
1.259	20.5	15.3	»
1.308	16.5	24.6	»
1.356	13.3	32.8	»
1.370	11.9	35.6	»
1.410	10.0	41.3	» +$NaNO_3$
1.414	7.44	44.5	$NaNO_3$
1.418	3.57	48.8	»
1.427	0.0	53.2	»

d of sat. sol.	Gms. per 100 gms. sat. sol. NaCl.	$NaNO_3$.	Solid Phase.
Results at 75°.			
1.176	27.5	0.0	NaCl
1.303	16.1	26.3	»
1.349	13.0	34.5	»
1.394	10.4	41.2	»
1.435	8.4	46.9	»
1.456	7.47	49.9	» +$NaNO_3$
1.458	6.13	51.2	$NaNO_3$
1.460	3.72	54.2	»
1.469	0.0	58.7	»
Results at 100°.			
1.164	28.6	0.0	NaCl
1.276	17.6	24.0	»
1.331	13.1	33.9	»
1.390	10.2	43.0	»
1.429	8.20	48.7	»
1.443	7.68	50.7	»
1.472	6.55	54.2	»
1.485	6.20	55.7	»
1.496	5.79	56.9	»
1.500	5.63(6.6)*	57.4(58.7)*	» +$NaNO_3$
1.501	3.97	59.4	$NaNO_3$
1.502	2.82	60.6	»
1.507	0.0	65.7	»
Results at 20°. (Findlay and Cruick-hank, 1926.)			
	18.49	18.62	NaCl
	17.34	21.30	»
	13.80	30.34	» +$NaNO_3$
—	9.56	34.85	$NaNO_3$
—	7.67	37.18	»

* This result is by Wurmser, 1922.

Solubility of Sodium Chloride in Aqueous Solutions of Sodium Sulfate and Vice Versa at Several Temperatures.

Gms. per 100 gms. sat. sol. NaCl.	Gms. per 100 gms. sat. sol. Na_2SO_4.	Solid Phase.
Results at 0°. (Pelling, 1925.)		
19.6	1.11	$Na_2SO_4.10H_2O$
14.2	1.22	»
Results at 25°. (Takegami, 1920, 1921.)		
26.49	0.0	NaCl
24.57	3.00	»
22.98	6.80	» $+Na_2SO_4$
20.47	8.60	Na_2SO_4
18.95	10.12	»
13.06	15.60	»
13.61	15.18	» $+Na_2SO_4.10H_2O$
Results at 25°. (Takegami, 1920, 1921.)		
9.74	15.65	$Na_2SO_4.10H_2O$
4.21	18.25	»
0.0	21.54	»
Results at 94°.5. (Pelling, 1925.)		
27.96	0.3	NaCl
27.17	2.43	»
25.8	4.42	» $+Na_2SO_4$
16.8	9.82	Na_2SO_4
15.56	10.8	»
2.32	26.3	»
0.0	30.25	»

The following determinations are by Kournakow and Zemcznyj, 1919, 1924.

Mols. per 1000 mols. H_2O Na_2Cl_2.	Mols. per 1000 mols. H_2O Na_2SO_4.	Solid Phase.
Results at 0°.		
54.9	0.0	NaCl
54.0	2.0	» $+Na_2SO_4.10H_2O$
0.0	6.3	$Na_2SO_4.10H_2O$
Results at 25°.		
55.5	0.0	NaCl
52.6	5.8	»
52.2	10.3	NaCl
50.9	12.4	» $+Na_2SO_4$
33.0	25.4	Na_2SO_4
31.4	26.9	» $+Na_2SO_4.10H_2O$
27.5	27.6	$Na_2SO_4.10H_2O$
0.0	35.5	»

Solubility of Sodium Chloride in Aqueous Solutions of Sucrose at 25° and Vice Versa. (Schoorl, 1923.)

Gms. per 100 gms. sat. sol. NaCl.	Gms. per 100 gms. sat. sol. $C_{12}H_{22}O_{11}$.	Solid Phase.
23.3	12.7	NaCl
17.5	36.7	»
16.2	43.0	» + 1.1.2
9.75	57.0	1.1.2
8.6	62.2	$1.1.2 + C_{12}H_{22}O_{11}$
11.5	61.7	NaCl + »
6.15	63.0	$C_{12}H_{22}O_{11}$
1.62	66.0	»

$1.1.2 = NaCl.C_{12}H_{22}O_{11}2H_2O$.

The author also gives very complete vapor tension data for this system.

Solubility of Sodium Chloride at 20° in Aqueous 50 per cent Ethyl Alcoho Containing Increasing Amounts of Benzene. (Wright, 1926.)

Per cent C_6H_6 in aq. 50 % alcohol...	0.0	1.91	4.10	5.34	7.95
Gms. NaCl per 100 gms. sat. sol.....	9.80	9.86	9.95	10.10	10.35

100 gms. 86.5 % glycerol ($d = 1.2326$) dissolve 10.37 gms. NaCl at 20°.
» 98.5 % » ($d = 1.2645$) » 8.28 gms. »
(Holm, 1921, 1922.)

Solubility of Sodium Chloride in Pure Hydrogen Peroxide, Determined by the Freezing-Point Method. (Maass and Hatcher, 1922.)

t° of f. pt.	Gms. NaCl per 100 gms. sat. sol.	t° of f. pt.	Gms. NaCl per 100 gms. sat. sol.	t° of f. pt.	Gms. NaCl per 100 gms. sat. sol.
—2.37.....	1.68	— 7.67....	8.61	—10.37....	15.63
—3.62.....	3.14	—10.7.....	11.81	0.0+...	17.0
—5.07.....	5.42				

100 gms. normal butyl alcohol ($d = 0.806$) dissolve 0.014 gm. NaCl at 25°.
(Willard and Smith, 1922, 1923.)

100 cc. sat. solution of sodium chloride in ethyl urethan contain 0 132 gm. Na Cl at 60°. (Stuckgold, 1917.)

100 gms. sat. solution of sodium chloride in selenium oxychloride ($Se O Cl_2$) contain 0.57 gm. Na Cl at 25°. (Wise, 1923.)

Fusion-point data for mixture of sodium chloride and strontium chloride are given by Scholich, 1920.

SODIUM CHROMATE $Na_2 Cr O_4$.

Equilibrium in the System Sodium Chromate, Sodium Sulfate and Water. (Osaka and Yoshida, 1922.)

This is a continuation of the work of Takenchi, 1925 (see remarks at bottom of p. 651 of the preceding volume of « Solubilities »). Data are now given for the isotherms at 28°, 31° and 33°. The results are, however, expressed in accordance with the formula 100 m $H_2 O$, x $Na_2 Cr O_4$ (100 — x) $Na_2 SO_4$, and the tables show only numerical values corresponding to x and m.

SODIUM CYANATE NaCNO.

100 gms. alcohol of $d_{17} = 0.799$ dissolve 0.22 gm. Na C NO at 0° and 0.52 gm. at the b. pt.

100 gms. benzene dissolve 0.13 gm. Na C NO at the b. pt. (Cranston and Livingstone, 1926.)

SODIUM FERROCYANIDE $Na_4 Fe(CN)_6 . 10 H_2 O$.

Solubility of Sodium Ferrocyanide in Water. (Farrow, 1926.)

t°.	d of sat. sol.	Gms. $Na_4 Fe(CN)_6$ per 100 gms. sat. sol.	t°.	d of sat. sol.	Gms. $Na_4 Fe(CN)_6$ per 100 gms. sat. sol.
24.9.....	1.1312	17.11	81.7 (tr.pt.).	—	—
34.9.....	1.1584	20.58	84.7.....	1.2916	38.15
49.8.....	1.2004	26.20	89.6.....	1.2959	38.08
64.7.....	1.2426	31.43	94.7.....	1.2870	38.25
79.6.....	1.2786	36.85	99.7.....	1.2861	37.53

The solid phase below 81°.7 is $Na_4 Fe(CN)_6 . 10 H_2 O$.

Simultaneous Solubility of Sodium Ferrocyanide and Sodium Sulfate in Water at Various Temperatures. (Dominik, 1922.)

t°.	d of sat. sol.	Gms. per 100 cc. sat. sol. $Na_4 Fe(CN)_6$.	Gms. per 100 cc. sat. sol. $Na_2 SO_4$.	t°.	d of sat. sol.	Gms. per 100 cc. sat. sol. $Na_4 Fe(CN)_6$.	Gms. per 100 cc. sat. sol. $Na_2 SO_4$.
10....	1.136	8.94	7.33	34....	1.357	4.95	42.20
14....	1.147	9.46	8.58	42....	1.353	8.64	38.69
23.5..	1.228	8.64	19.53	55....	1.299	16.42	31.47
32....	1.357	4.90	42.25	63....	1.300	27.85	28.08

SODIUM FLUORIDE NaF.

Solubility of Sodium Fluoride in Aqueous Solutions of Hydrofluoric Acid at 20°. (Jehn and Hudleston, 1924.)

Saturation was obtained by constant stirring in a thermostat for 14 and 30 days. Paraffine bottles were employed.

Gms. per 100 gms. H_2O. NaF.	HF.	Solid Phase.	Gms. per 100 gms. H_2O. NaF.	HF.	Solid Phase.
3.96	0.0	NaF	2.46	1.16	NaF.HF
4.14	0.081	»	2.49	1.20	»
4.19	0.104	»	2.20	1.55	»
4.23	0.135	»	2.04	2.22	»
4.51	0.420	»	2.01	2.70	»
4.56	0.484	»+NaF.HF	1.88	4.17	»
3.45	0.660	NaF.HF	1.83	8.68	»
2.99	0.831	»	1.79	10.28	»

SODIUM FORMATE $HCOONa$.

THE FREEZING-POINTS OF AQUEOUS SOLUTIONS OF SODIUM FORMATE.

(Sidgwick and Gentle, 1922.)

t°. of f. pt.		—5.29.	—7.02.	—11.02.	—18.04.
Gms. $HCOONa$ per 100 gms. sat. sol.		7.24	11.42	16.95	24.86

SODIUM FORMALDEHYDE SULFOXALATE $NaHSO_2.CH_2O.2H_2O$.

100 cc. sat. solution of sodium formaldehyde sulfoxalate in glycerol of $d = 1.262$ contain 50.66 gms. sulfoxalate at 18° and the density of the saturated solution is 1.375.

100 cc. sat. solution of sodium formaldehyde sulfoxalate in methyl alcohol of $d = 0.8$ contain 8.39 gms. sulfoxalate at 18° and the density of the saturated solution is 0.845. (Heyl and Greer, 1922.)

SODIUM FUMARATES; Neutral, $Na_2C_4H_2O_4$; Acid, $NaC_4H_3O_4$.

100 gms. H_2O dissolve 22.83 gms. neutral sodium fumarate at 25°.

100 gms. H_2O dissolve 6.87 gms. acid sodium fumarate at 25°, 10.74 gms. at 40° 18.15 gms. at 60° and 30.2 gms. at 100°. (Weiss and Downs, 1923.

SODIUM GUANYLATE.

SOLUBILITY OF SODIUM GUANYLATE IN AQUEOUS SOLUTIONS OF SODIUM ACETATE AND OF SODIUM CHLORIDE AT 20°.

(Feulgen and Rossenbeck, 1923.)

Warm solutions of sodium guanylate were prepared and these cooled untill a slight excess of the salt separated. They were then allowed to stand many hours in a thermostat at 20°. The nitrogen in a given volume of the saturated solution was determined and from this the amount of guanylate present was calculated.

Normality of aq. salt solution.	Results for aq. CH_3COONa solutions. Gms. per 100 cc. solution. CH_3COONa.	N.	Na guanylate.	Results for aq. NaCl solutions. Gms. per 100 cc. solution. NaCl.	N.	Na guanylate.
0.0 (= H_2O)	0.0	—	2.89	0.0	—	2.88
0.0625	0.86	0.42	2.45	0.37	0.49	2.85
0.25	3.45	0.315	1.81	1.46	0.29	1.68
1.00	13.81	0.08	0.48	5.85	0.12	0.67
2.00	27.22	0.04	0.20	—	—	—
4.00	54.44	0.020 0.025	0.11 0.15	23.4	0.035 0.048	0.20 0.28

The results are considered of interest in showing the quantitative limits of the sodium acetate method for the determination of guanylic acid.

SODIUM HYDROXIDE $NaOH$.

FREEZING-POINTS OF DILUTE AQUEOUS SOLUTIONS OF SODIUM HYDROXIDE

(Klein and Svanberg, 1920.)

t° of f. pt.	—0.33.	—0.867.	—1.72.
Normality of aq. NaOH	0.1	0.25	0.50

FREEZING-POINTS OF MIXTURES OF SODIUM HYDROXIDE AND WATER.

(Von Antropoff and Sommer, 1926.)

t° of beginning of crystallization.	t° of transition.	t°. of eutec.	Gms. per 100 gms. of mixture. NaOH.	H_2O.
322	303	—	100.0	0.9
319	305	48	98.7	1.3
298	—	53	96.7	3.3
265	—	56	91.7	8.4
205	—	56	85.5	14.5
—	—	58	76.2	23.8

The authors also give data for the system $NaOH + NaCl + H_2O$.

EQUILIBRIUM IN THE SYSTEM SODIUM HYDROXIDE, SODIUM SULFITE AND WATER (Hammick and Currie, 1925.)

The mixtures were constantly stirred for 24 to 48 hours. Silver vessels were used for the stronger sodium hydroxide solutions. Both the saturated solutions and the solid phases were analyzed. The temperatures were constant to within 0°.1. The results are probably accurate to ± 0.5 per cent.

Gms. per 100 gms. sat. sol. NaOH.	Gms. per 100 gms. sat. sol. Na_2SO_3.	Solid Phase.
Results at 0.15°.		
29.5	0.0	$NaOH.4H_2O$
29.1	0.1	» + Na_2SO_3
27.9	0.1	Na_2SO_3
27.1	0.4	»
26.6	0.7	»
25.4	1.3	»
23.3	2.2	» + $Na_2SO_3.7H_2O$
21.9	2.21	$Na_2SO_3.7H_2O$
16.9	2.8	»
9.0	5.2	»
3.0	9.0	»
0.0	12.3	»
Results at 20°.		
52.2	0.0	$NaOH.H_2O$
50.1	trace	Na_2SO_3
36.3	0.1	»
26.8	1.0	»
24.9	1.1	»
20.2	3.5	»
16.0	6.7	»
15.5	7.0	»
13.8	8.6	» + $Na_2SO_3.7H_2O$
14.0	9.0	» »
13.4	9.2	$Na_2SO_3.7H_2O$
12.7	9.4	»
12.2	9.6	»
11.6	9.9	»
9.9	11.0	»
8.3	12.0	»
4.4	15.4	»
1.6	18.7	»
0.0	21.3	»
Results at 25°.		
53.3	0.0	$NaOH.H_2O$
43.9	trace	Na_2SO_3
42.7	0.1	»
29.4	0.3	»
28.7	0.5	»
25.2	1.0	»
20.7	2.5	»
20.7	2.9	»
17.2	5.8	»
14.2	8.2	«
12.6	10.1	»
12.2	10.2	»
9.6	13.8	» + $Na_2SO_3.7H_2O$
9.8	13.2	» »
9.7	13.0	$Na_2SO_3.7H_2O$
5.0	17.7	»
2.5	19.3	»
0.7	22.5	»
0.0	23.6	»
Results at 32°.		
54.4	0.0	$NaOH.H_2O$
51.8	0.001	Na_2SO_3
36.2	0.1	»
27.2	0.6	»
20.1	2.9	«
16.5	5.4	»
11.1	11.2	»
7.6	15.7	»
5.1	19.1	»
2.3	23.1	»
0.6	26.4	»
0.0	26.5	»

SODIUM HYPOCHLORITE $NaClO.5H_2O$.

SOLUBILITY OF SODIUM HYPOCHLORITE IN WATER, DETERMINED BY THE FREEZING-POINT METHOD. (Sanfourche and Gardnet, 1924.)

t°.	Gms. NaClO per 100 gms. sat. sol.	Solid Phase.
— 2.6....	5.0	Ice
— 7.0....	10.0	»
—12.0....	15.0	»
—16.6....	19.2	Ice + $NaClO.5H_2O$
—12.0....	20.0	$NaClO.5H_2O$
0.....	22.7	»
+10.0....	26.7	»
15.0....	30.6	»
20.....	34.8	»
23.0....	39.0	$NaClO.5H_2O$
24.0....	42.0	»
24.5 m.pt.	44.0	»
24.0....	46.0	»
23.0 tr.pt.	48.5	$NaClO.5H_2O$ + $NaClO.2,5H_2O$
30.0....	50.0	$NaClO.2,5H_2O$
40.0....	52.5	»
50.0....	56.5	»
56.0....	61.2	»

SODIUM IODIDE.

Equilibrium in the System Sodium Iodide, Acetone and Water at 25°.
(Macy and Thomas, 1926.)

The materials were carefully purified. Saturation was secured by constant stirring in a thermostat.

d of sat. sol.	Gms. per 100 gms. sat. sol. NaI.	Gms. per 100 gms. sat. sol. CH_3COCH_3.	Solid Phase.	*d* of sat. sol.	Gms. per 100 gms. sat. sol. NaI.	Gms. per 100 gms. sat. sol. CH_3COCH_3.	Solid Phase.
1.927	67.0	0.0	$NaI.2H_2O$	1.240	40.5	53.4	NaI
1.753	60.2	8.2	»	1.192	37.7	58.0	»
1.565	54.3	19.4	»	1.144	34.7	62.9	»
1.450	49.9	30.1	»	1.067	29.4	70.6	» (unstable)
1.358	46.3	40.3	»	1.062	25.8	71.5	$NaI.3(CH_3COCH_3)$
1.320	44.5	46.1	» + NaI				

Solubility of Sodium Iodide in Acetone.

Results of Macy and Thomas, 1926.				Results of Wadsworth and Dawson, 1926.		
t°.	*d* of sat sol.	Gms. NaI per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. NaI per 100 gms. CH_3COCH_3.	Solid Phase.
—34.0...	—	3.2	$NaI.3(CH_3COCH_3)$	—20.0...	5.5	$NaI.3(CH_3COCH_3)$
—12.3...	0.873	7.4	»	—10.0...	7.8	»
0.0...	0.899	11.6	»	0.0...	11.8	»
+15.9...	0.984	21.0	»	10.0...	18.2	»
25.0...	1.062	28.5	»	20.0...	30.0	»
25.7...	1.070	29.2	» + NaI	25.7...	40.7	» + NaI
25.0...	1.067	29.4	NaI (unstable)	30.0...	39.2	NaI
32.2...	1.043	32.2	NaI	40.0...	35.6	»
40.2...		26.8	»	50.0...	32.0	»
50.0...		25.0	»	60.0...	28.6	»
57.2...	—	23.6	»	70.0...	25.1	»
59.8...	—	23.0	»	80.0...	21.8	»

Solubility of Sodium Iodide in Ethyl Alcohol at 25°.
(King and Partington, 1926.)

The authors used the greatest possible care in the purification of the alcohol and sodium iodide. They used a special apparatus designed to prevent the entrance of moisture and kept the solution in contact with dry hydrogen. The mixture was constantly stirred for 16 hours. The mean of 10 determinations gave 42.57 gms. Na I per 100 gms C_2H_5OH and the $d_{\frac{25}{4}}$ of the sat. sol. was 1.037.

Solubility of Sodium Iodide in Methyl Ethyl Ketone.
(Wadsworth and Dawson, 1926.)

t.	Gms. NaI per 100 gms. $CH_3CO.C_2H_5$.	Solid Phase.	t.	Gms. NaI per 100 gms. $CH_3COC_2H_5$	Solid Phase.
—70.....	7.3	$NaI.3(CH_3CO.C_2H_5)$	10.....	17.4	NaI
—60.....	10.0	»	20.....	15.0	»
—50.....	14.0	»	30.....	12.7	»
—30.....	28.0	» + NaI	40.....	10.7	»
—20.....	25.0	NaI	50.....	8.9	»
—10.....	22.8	»	60.....	7.4	»
0.....	20.1	»	70.....	6.2	»

SODIUM MALEATE $Na_2C_4H_2O_4.{}^1/_2H_2O$.

100 gms. H_2O dissolve 96.06 gms. $Na_2C_4H_2O_4$ at 25°. (Weiss and Downs, 1923.)

SODIUM Acid **MALEATE** $NaC_4H_3O_4.3H_2O$.

100 gms. H_2O dissolve 6.73 gms. $NaC_4H_3O_4$ at 25°, 12.81 gms. at 40°, 31.3 gms. at 60° and 288.0 gms. at 100°. (Weiss and Downs, 1923.)

SODIUM MOLYBDATES, Para and Tri.

Solubility of Each in Water at 30°. (Rosenheim, 1916.)

Compound.	Formula.	Gms. anhydrous compound per 100 gms. sat. sol.
Sodium para molybdate...	$5Na_2O.12MoO_3.38H_2O$	54.06
Sodium tri molybdate.....	$Na_2Mo_3O_{10}.7H_2O$	13.68

SODIUM NITRATE $NaNO_3$.

Freezing-Points of Aqueous Solutions of Sodium Nitrate.
(Klein and Svanberg, 1920; Rodebush, 1918.)

t° of f. pt.	Gms. $NaNO_3$ per 100 cc. sat. sol.	t° of f. pt.	Gms. $NaNO_3$ per 100 gms. H_2O.	t° of f. pt.	Gms. $NaNO_3$ per 100 gms. H_2O.
—0.340.....	0.85 (K and S)	— 6.67.....	20.83	—12.85.....	44.56
—0.822.....	2.125 »	— 8.78.....	28.77	—15.08.....	53.14
—1.583.....	4.25 »	—10.17.....	34.15	—17.46 Eutec.	62.50

100 gms. H_2O dissolve 84.86 gms. $NaNO_3$ at 16°.2, 87.81 gms. at 20° and 92.02 gms. at 25°. (Mondain-Monval, 1925.)

Solubility of Sodium Nitrate in Aqueous Solutions of Nitric Acid.
(Kazantzev, 1923, 1925.)

Results at 15°.				Results at 75°.			
Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
$NaNO_3$.	HNO_3.	$NaNO_3$.	HNO_3.	$NaNO_3$.	HNO_3.	$NaNO_3$.	HNO_3.
45.4	0.0	2.5	64.6	58.3	0.0	6.8	63.7
33.0	9.5	2.3	74.6	38.5	17.2	6.2	70.8
29.0	13.0	3.5	80.9	25.6	30.5	5.9	78.3
14.5	28.3	4.9	84.8	19.7	38.0	7.4	87.0
5.0	49.7	7.8	89.3	17.2	41.7	7.7	87.7
						8.1	88.9

Equilibrium in the System Sodium Nitrate, Sodium Sulfate and Water
(Massink, 1918; Foote, 1925; Hamid, 1926.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$NaNO_3$.	Na_2SO_4.	Solid Phase.	$NaNO_3$.	Na_2SO_4.	Solid Phase.
Results at 0°. (Foote, 1925.)			Results at 25°. (Foote, Massink, Hamid.		
42.26	0.0	$NaNO_3$	47.8	0.0	$NaNO_3$
38.31	4.53	»+$Na_2SO_4.10H_2O$	46.25	2.0	»
37.79	4.75	» »	45.6	3.0	»+1.1.1
0.0	4.56	$Na_2SO_4.10H_2O$	42.5	4.0	1.1.1
Results at 10°. (Massink, 1918.)			40.0	4.8	»
44.60	0.0	$NaNO_3$	37.5	6.0	»
42.40	2.85	»+$Na_2SO_4.10H_2O$	35.0	7.4	»
42.68	3.08	» »	32.5	9.1	»
41.20	2.87	$Na_2SO_4.10H_2O$	29.0	11.5	»
32.25	3.13	»	26.0	14.0	»+Na_2SO_4
0.0	8.26	»	25.0	14.7	Na_2SO_4
Results at 20°. (Massink, 1918.)			24.5	15.1 (Foote)	»+$Na_2SO_4.10H_2O$
46.8	0.0	$NaNO_3$	23.3	15.7	» »
44.4	3.3	»+1.1.1	21.3	15.5	$Na_2SO_4.10H_2O$
41.69	4.18	1.1.1	17.5	15.9	»
37.42	6.22	»	15.0	16.4	»
34.53	7.70	»	12.5	16.9	»
33.85	8.77	»+$Na_2SO_4.10H_2O$	10.0	17.7	»
33.75	8.63	$Na_2SO_4.10H_2O$	7.0	18.6	»
9.67	13.55	»	4.0	19.8	»
0.0	16.25	»	0.0	21.8	»

1.1.1 = $NaNO_3.Na_2SO_4.H_2O$.

EQUILIBRIUM IN THE SYSTEM SODIUM NITRATE, SODIUM SULFATE AND WATER AT 35° (CON.). (Foote, 1925.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$NaNO_3$.	Na_2SO_4.	Solid Phase.	$NaNO_3$.	Na_2SO_4.	Solid Phase.
50.2	0.0	$NaNO_3$	30.0	11.0	Na_2SO_4
49.0	1.25	»	25.0	13.9	»
48.2	2.5	»+1.1.1	20.0	17.1	»
45.0	3.5	1.1.1	15.0	20.6	»
41.0	5.2	»	10.0	24.3	»
37.0	7.2	»	5.0	28.2	»
34.1	8.85	»+Na_2SO_4	0.0	33.1	»

1.1.1 = $NaNO_3.Na_2SO_4.H_2O$.

NOTE. — The above table was constructed from the curve drawn from the results of Foote, 1925. The determinations were made with the greatest care and both the saturated solutions and the solid phases were analyzed.

The transition temperature between $Na_2SO_4.10\,H_2O$ and Na_2SO_4 in presence of the double salt 1.1.1 was found to be at 24.5° and 100 gms. of the saturated solution contained 25.92 gms. $NaNO_3$ and 14.24 gms. Na_2SO_4. The transition temperature at which both a single and double salt are in equilibrium is 13°.5 and 100 gms. of the saturated solution contain 41.62 gms. $NaNO_3$ and 4.18 gms. Na_2SO_4.

In addition to these results Massink, 1918, gives tables for the 30°, 34° and 35° isotherm. His results, however, differ considerably from those of Foote, especially in the region of the double salt. His curves have branches corresponding to two other double salts, $3\,NaNO_3.4\,NaSO_4$ and $3\,NaNO_3.2\,Na_2SO_4$, the existence of which Hamid, 1926, was unable to confirm.

100 gms. of aqueous solution, simultaneously saturated with sodium nitrate and sodium sulfate at 90°, contain 58.66 gms. $NaNO_3$ + 2.53 gms. Na_2SO_4.

(Hamid, 1926.

SOLUBILITY OF SODIUM NITRATE IN HYDROGEN PEROXIDE.

(Maass and Hatcher, 1922.)

The temperature were determined at which the last trace of solid disappeared in mixtures of weighed amounts of the two constituents.

t°.	Gms. $NaNO_3$ per 100 gms. sat. sol.	t°.	Gms. $NaNO_3$ per 100 gms. sat. sol.	t°.	Gms. $NaNO_3$ per 100 gms. sat. sol.
—2.47.....	1.62	—5.62.....	10.11	—10.82.....	22.25
—2.82.....	3.23	—6.97.....	13.19	+11.8.....	25.22
—3.72.....	5.11	—8.12.....	16.66	32.3.....	28.25
—4.72.....	7.58	—9.52.....	20.19	49.3.....	31.53

100 gms. aq. 50 wt. % ethyl alcohol dissolve 19.4 gms. $NaNO_3$ at 20°.

(Wright, 1926.)

SODIUM NITRITE $NaNO_2$.

FREEZING-POINTS OF AQUEOUS SOLUTIONS OF SODIUM NITRITE.

(Helberg, 1925.)

t° of f. pt.	Gms. $NaNO_2$ per 100 gms. sat. sol.	t° of f. pt.	Gms. $NaNO_2$ per 100 gms. sat. sol.
— 5.0.....	9.8	—14.0.....	20.35
— 7.0.....	12.65	—20.5.....	30.8
—10.0.....	16.1	—26.0 (Eutec.).....	38.0
—11.0.....	17.35		

SODIUM PHENOLATES. $C_6H_5ONa.3H_2O$ and $C_6H_5ONa.2C_6H_5OH$.

EQUILIBRIUM IN THE SYSTEM SODIUM HYDROXIDE, PHENOL AND WATER AT 25°. (von Meurs, 1916.)

Mols. per 100 mols. sat. sol.			Mols. per 100 mols. sat. sol.		
NaOH.	C_6H_5OH.	Solid Phase.	NaOH.	C_6H_5OH.	Solid Phase.
33.92	0.0	$NaOH.H_2O$	16.56	28.99	$C_6H_5ONa.3H_2O$
26.56	0.08	$C_6H_5ONa.3H_2O$	16.62	31.75	»
23.69	0.61	»	16.47	36.54	$C_6H_5ONa.2C_6H_5OH$
19.47	2.06	»	14.25	44.81	»
18.19	5.18	»	13.17	48.31	»
17.61	6.91	»	10.74	57.47	»
16.52	10.08	»	7.88	67.03	»
15.27	13.41	»	5.68	73.37	C_6H_5OH
15.21	14.61	»	3.32	73.98	»
15.89	19.67	»	0.0	74.27	»
15.98	23.24	»			

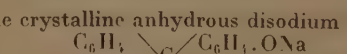
SODIUM Salts of PHENOLPHTALEIN.

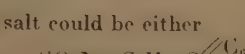
EQUILIBRIUM IN THE SYSTEM SODIUM OXIDE, PHENOLPHTHALEIN ANHYDRIDE AND WATER AT 25°. (Bassett and Halton, 1923.)

Saturation was secured by constant rotation in a thermostat for 3 days. Both the solutions and the solid phases were analyzed. The compositions of the latter were established by the "rest method".

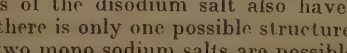
Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
	Phenolphthalein			Phenolphthalein	
Na_2O.	anhydride.	Solid Phase.	Na_2O.	anhydride.	Solid Phase.
0.58	2.90	Phenolphthalein	10.24	31.00	Tri sodium salt $14H_2O$
2.71	13.74	»	10.37	27.89	»
4.25	22.43	»	11.34	25.03	»
6.11	31.96	»	12.69	23.25	»
6.95	36.06	Mono sodium salt+$8H_2O$	13.73	20.51	Tri sodium salt $13H_2O$
7.48	37.73	»	14.29	16.91	»
8.32	41.16	»	17.48	10.35	»
6.78	33.34	Mono sodium salt+$4H_2O$	19.8	9.12	Tri sodium salt $12H_2O$
9.31	37.36	»	20.32	4.28	»
9.88	41.45	»	23.46	1.37	»
10.06	44.06	»	25.42	0.86	»
11.00	45.55	Disodium salt, anhydrous	27.01	0.11	Tri sodium salt $6H_2O$
12.31	40.16	»	28.03	0.0	»
11.67	37.79	Di sodium salt $4H_2O$	30.74	0.0	»
11.98	34.78	»	37.44	0.23	»
9.97	38.42	Di sodium salt $8H_2O$	39.88	0.0	» $NaOH.H_2O$
10.17	33.72	»			

The crystalline anhydrous disodium salt could be either



or


Since it is colorless it must be regarded as the diphenolic salt. The two hydrated forms of the disodium salt also have the phenolic structure. For the trisodium salt there is only one possible structure, namely, $CO_2Na.C_6H_4.C(C_6H_4ONa)_2.OH$, but two mono sodium salts are possible. They are $CO_2Na.C_6H_4.C(C_6H_4OH)_2.OH$ and



. It is probable that the solid hydrated mono sodium salts, which have been obtained in the present investigation, have the phenolic structure shown by the latter formula.

SODIUM Nitro PHENOLATE (*p*) $C_6H_4NO_2.ONa.2H_2O$.

Solubility of Sodium Para Nitro Phenolate in Aqueous Alcohol at 25°.

(Fischer, 1914, 1918.)

Saturation was secured by means of constant agitation in a thermostat. The compound also crystallized with 4 H_2O but in all concentrations of alcohol above 15 per cent the solid phase was $C_6H_4NO_2.ONa.2H_2O$.

Vol. % C_2H_5OH.	Gms. *p* $C_6H_4NO_2.ONa$ per 100 cc. sat. sol.	Vol. % C_2H_5OH.	Gms. *p* $C_6H_4NO_2.ONa$ per 100 cc. sat. sol.	Vol. % C_2H_5OH.	Gms. *p* $C_6H_4NO_2.ONa$ per 100 cc. sat. sol.
0.....	5.640	40.....	5.344	75.....	3.284
10.....	5.168	45.....	5.313	80.....	2.753
15.....	5.019	50.....	5.200	85.....	2.045
20.....	5.007	55.....	5.039	90.....	1.495
25.....	5.088	60.....	4.749	95.....	1.256
30.....	5.156	65.....	4.378	100.....	4.412
35.....	5.281	70.....	3.895		

SODIUM Chloro Nitro PHENOLATE $C_6H_3(4)Cl(2)NO_2(1)ONa.H_2O$.

Solubility of Chloro Nitro Phenolate in Aqueous Alcohol at 25°.

(Fischer, 1914, 1918.)

Vol. % C_2H_5OH.	Gms. $C_6H_3Cl(NO_2)ONa$ per 100 cc. sat. sol.	Solid Phase.	Vol. % C_2H_5OH.	Gms. $C_6H_3ClNO_2.ONa$ per 100 cc. sat. sol.	Solid Phase.
0....	2.702	$C_6H_3ClNO_2.ONa.H_2O$	55....	2.908–2.564*	
10....	2.374	»	60....	3.146	
15....	2.346	»	65....	3.110	$C_6H_3ClNO_2.ONa$
20....	2.314	»	70....	2.604	»
25....	2.404	»	75....	2.307	»
30....	2.576	»	80....	1.860	»
35....	2.708	»	85....	1.293	»
40....	2.990	»	90....	0.870	»
45....	3.190	»	95....	0.616	»
50....	3.068	» + $C_6H_3ClNO_2ONa$	100....	0.680	»

* Gradual dehydration by the alcohol occurs here.

SODIUM Dinitro PHENOLATE $C_6H_3(2,4)(NO_2)_2(1)ONa.H_2O$.

Solubility of Sodium Dinitro Phenolate at 25° in :

(Fischer, 1914, 1918.)

Aqueous Ethyl Alcohol.		Aqueous Methyl Alcohol.		Aqueous Acetone.	
Vol. % C_2H_5OH.	Gms. $C_6H_3(NO_2)_2.ONa.H_2O$ per 100 cc. sat. sol.	Vol. % C_2H_5OH.	Gms. $C_6H_3(NO_2)_2.ONa.H_2O$ per 100 cc. sat. sol.	Vol. % CH_3OH.	Gms. $C_6H_3(NO_2)_2.ONa.H_2O$ per 100 cc. sat. sol.
0....	4.461	55....	3.392	0....	4.461	0....	4.461
10....	3.516	60....	3.214	10....	3.686	10....	4.859
15....	3.246	65....	2.976	20....	3.196	20....	5.470
20....	3.188	70....	2.630	30....	2.950	30....	6.086
25....	3.090	75....	2.174	40....	2.854	40....	6.850
30....	3.148	80....	1.798	50....	2.824	50....	7.442
35....	3.260	85....	1.258	60....	2.792	60....	7.784
40....	3.386	90....	0.818	70....	2.672	70....	7.568
45....	3.440	95....	0.566	80....	2.518	80....	6.536
50....	3.470	100....	2.671	90....	2.475	90....	4.356
				100....	4.651	100....	1.085

Tri SODIUM PHOSPHATE (Ortho) $Na_3PO_4.12H_2O$.

Solubility of Tri Sodium Phosphate in Water. (Apfel, 1911.)

The saturated solutions were prepared by constant stirring in a thermostat. The author's determinations were calculated to the gram basis, plotted on cross section paper and the following values taken from the curve. The solid phases were identified only by estimation of their water of crystallization.

t°.	Gms. Na_3PO_4 per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. Na_3PO_4 per 100 gms. sat. sol.	Solid Phase.
0.....	4.3	$Na_3PO_4.12H_2O$	50.....	22.7	$Na_3PO_4.10H_2O$
10.....	7.6	»	55.....	26.2	»
20.....	10.8	»	60.....	28.5	»
25.....	12.3	»	65.....	30.2	»
30.....	14.0	»	70.....	32.7	$Na_3PO_4.8H_2O$
40.....	16.8	»	75.....	35.1	»

Di SODIUM (Hydrogen) PHOSPHATE $Na_2HPO_4.12H_2O$.

Solubility of Disodium Hydrogen Phosphate in Water. (Hammick, Goadby and Booth, 1920.)

Constant agitation in a thermostat was employed. The authors desired to correct some of the points reported by others.

t°.	Gms. Na_2HPO_4 per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. Na_2HPO_4 per 100 gms. sat. sol.	Solid Phase.
−0.47 eutec.	1.45	Ice + $Na_2HPO_4.12H_2O$	29.5.....	17.18	$Na_2HPO_4.12H_2O$ + $\beta Na_2HPO_4.12H_2O$
+6.0.....	2.73	$Na_2HPO_4.12H_2O$	30.1.....	19.45	$\beta Na_2HPO_4.12H_2O$
19.95.....	7.26	»	30.9.....	20.08	»
22.77.....	8.93	»	32.50.....	22.57	»
24.15.....	9.53	»	33.70.....	24.63	»
25.75.....	10.90	»	34.70.....	29.75	»
27.80.....	14.16	»	35.0.....	—	» + $Na_2HPO_4.7H_2O$
28.65.....	15.87	»	36.5.....	31.15	$Na_2HPO_4,7H_2O$
29.05.....	16.04	»	40.02.....	35.56	»

Data showing the effect of sodium chloride upon the transition temperatures of disodium phosphate hydrate are given by Okazawa, 1920.

Mono SODIUM (Dihydrogen) PHOSPHATE $NaH_2PO_4.2H_2O$.

Solubility of Mono Sodium Phosphate in Water. (Apfel, 1911.)

Constant stirring was employed. The solid phases were identified by determinations of their water of crystallization.

t°.	Mols. PO_4 per 1000 gms. sat. sol.	Gms. NaH_2PO_4 per 100 gms. sat. sol.	Solid Phase.
0.....	3.01	36.1	$NaH_2PO_4.2H_2O$
18.....	3.89	45.8	»
25.....	4.05	48.6	»
35.5.....	4.47	53.6	»
40.....	4.7	56.4	»
44.....	4.83	58.0	»
44.....	5.06	60.7	$NaH_2PO_4.H_2O$ (unstable)
50.....	5.15	61.8	$NaH_2PO_4.2H_2O$
55.....	5.32	63 8	$NaH_2PO_4.H_2O$
58.....	5.46	65.5	»
61.....	5.48	65.8	NaH_2PO_4
65.....	5.49	65.9	»
70.....	5.52	66.2	»
75.....	5.60	67.2	»
83.....	5.76	69.1	»

Solubility of Mono Sodium Phosphate in Aqueous Solutions of Sodium Sulfate at 25°. (Apfel, 1911.)

Mols. per 1000 gms. sat. sol.		Gms. per 100 gms. sat. sol.		
PO_4.	SO_4.	NaH_2PO_4.	Na_2SO_4.	Solid Phase.
4.05	0.0	48.6	0.0	$NaH_2PO_4.2H_2O$
3.92	0.11	47.0	1.56	»
3.82	0.26	45.8	3.69	»
3.58	0.45	43.0	6.39	»
3.28	0.71	39.3	10.1	»

SODIUM Hypo **PHOSPHATES** $Na_4(PO_3)_2.10H_2O$, $Na_3H(PO_3)_2.9H_2O$, $Na_2H_2(PO_3)_2.6H_2O$.

Equilibrium in the System Sodium Oxide, Phosphorus Tetroxide and Water at 30°. (Müller, 1916.)

Saturation was secured by constant agitation in a thermostat. The author's determinations were plotted and the following results were read from the diagram.

Gms. per 100 gms. sat. sol.			Gmg. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
Na_2O.	P_2O_5.	Solid Phase.	Na_2O.	P_2O_5.	Solid Phase.	Na_2O.	P_2O_5.	Solid Phase
0.83	0.84	Na_4	0.75	1.53	Na_2	0.75	1.53	Na_2
1.00	1.12	y	1.0	1.75	x	0.80	1.85	
1.2	1.40	y	1.2	1.97	x	0.90	2.55	
1.4	1.67	y	1.4	2.20	x	1.00	3.16	
1.6	1.97	y	1.6	2.44	x	1.10	3.85	
1.8	2.28	y	1.8	2.65	x	1.20	4.50	
2.0	2.56	y	2.0	2.90	x	1.30	5.25	
2.2	2.85	y	2.2	3.15	x	1.40	5.90	
2.35	3.07	Na_3	2.35	3.38	Na_3	1.47	6.57	

$Na_4 = Na_4(PO_3)_2.10H_2O$; $Na_3 = Na_3H(PO_3)_2.9H_2O$; $Na_2 = Na_2H_2(PO_3)_2.6H_2O$.

The author was unable to identify the solid phases corresponding to the three branches of the solubility diagram of this system.

Solubility of Sodium Hypophosphate, Sodium Hydrogen Hypophosphate and of Sodium Dihydrogen Hypophosphate, each Separately, in Water. (Müller, 1916.)

Sodium Hypophosphate $Na_2PO_3.5H_2O$.		Sodium Hydrogen Hypophosphate $Na_3H(PO_3)_2.9H_2O$.		Sodium Dihydrogen Hypophosphate $NaHPO_3.5H_2O$.	
t°.	Gms. Na_2PO_3 per 100 gms. sat. sol.	t°.	Gms. $Na_3H(PO_3)_2$ per 100 gms. sat. sol.	t°.	Gms. $NaHPO_3$ per 100 gms. sat. sol.
25.2.....	1.47	25.....	4.46	25.....	1.95
30.....	1.68	30.2.....	5.55	30.....	2.50
35.....	1.91	35.2.....	6.68	35.....	2.99
40.2.....	2.24	40.....	8.30	40.....	3.66
45.....	2.64	45.....	10.60	45.....	4.55
50.....	3.08	50.....	13.02	50.....	5.61

SODIUM Methyl **PHOSPHATE** (neutral) $Na_2CH_3PO_4.6H_2O$.

100 gms. sat. solution of neutral sodium methyl phosphate in water contain 30.79 gms. of the anhydrous salt at 12°.5. (Bailly, 1919.)

SODIUM β Glycero **PHOSPHATE** $Na_2C_3H_5(OH)_2PO_4.5H_2O$.

100 gms. sat. solution of sodium β glycerophosphate in water contain 27.16 gms. of the anhydrous compound at 17°. (Bailly, 1916.)

100 gms. H_2O dissolve 27.38 gms. sodium glycerophosphate at 18°. (H. Rogier, *These*, Paris, 1912.)

100 gms. 86.5 % Glycerol ($d = 1.2326$) dissolve 79.7 gms. of sodium glycerophosphate (?hydrated) at 20°.

100 gms. 98.5 % Glycerol ($d = 1.2645$) dissolve 82.4 gms. of sodium glycerophosphate (?hydrated) at 20°. (Holm, 1921, 1922.)

SODIUM Hydro PHOSPHITE $Na_2HPO_3.5^1/_2H_2O$.

Solubility of Sodium Hydrophosphite in Water. (Rosenheim and Reglin, 1921.)

t°.	Gms. Na_2HPO_3 per 100 gms. sat. sol.	t°.	Gms. Na_2HPO_3 per 100 gms. sat. sol.
0	80.72	30	84.96
20	81.06	38	91.94
25	82.21	43	92.70

SODIUM PHTHALATE $2Na_2C_8H_4O_4.7H_2O$.

Equilibrium in the System Sodium Phthalate, Sodium Sulfate and Water. (Foote and Smith, 1924.)

Gms. per 100 gms. sat. sol. $Na_2C_8H_4O_4$.	Gms. per 100 gms. sat. sol. Na_2SO_4.	Solid Phase.
Results at 0°.		
40.56	0.0	$2Na_2C_8H_4O_4.7H_2O$
40.20	0.56	»+$Na_2SO_4.10H_2O$
25.83	0.63	$Na_2SO_4.10H_2O$
0.0	4.48	»
Results at 25°.		
43.79	0.0	$2Na_2C_8H_4O_4.7H_2O$
40.63	3.52	»
39.92	4.57	»+Na_2SO_4
37.94	5.48	Na_2SO_4
30.88	8.69	»
24.62	12.62*	»
13.67	20.91*	»
35.40	6.29	»+$Na_2SO_4.10H_2O$
34.06	6.39	$Na_2SO_4.10H_2O$
Results at 25° (con.).		
27.52	7.59	$Na_2SO_4.10H_2O$
21.09	9.67	»
17.47	11.12	»
12.35	13.61	»
10.14	14.78	»
7.39	16.53	»
6.18	17.35	»
0.0	21.75	»
Results at 35°.		
46.06	0.0	$Na_2C_8H_4O_4.7H_2O$
43.25	3.25	»+Na_2SO_4
28.64	9.67	Na_2SO_4
11.25	22.38	»
0.0	33.10	»

* Supersaturated with respect to $Na_2SO_4.10H_2O$.

SODIUM PICRATE $C_6H_2(NO_2)_3ONa.H_2O$.

Solubility of Sodium Picrate in Aqueous Solutions of Ethyl Alcohol. (Fischer, 1914, 1918.)

At 0° the mixtures were stirred in a vessel which was cooled by melting ice. At 25° the mixtures were constantly agitated in a thermostat. The dissolved picrate was determined either by evaporating and weighing the residue or by a method of titration. The concentration of the aqueous alcohol mixtures was controlled by density determinations.

The solid phase in contact with the saturated solutions was $C_6H_2(NO_2)_3ONa.H_2O$ in all cases.

Results at 0°.

Vol. % C_2H_5OH.	Gms. $C_6H_2(NO_2)_3ONa$ per 100 cc. sat. sol.	Vol. % C_2H_5OH.	Gms. $C_6H_2(NO_2)_3ONa$ per 100 cc. sat. sol.
0	1.824	45	1.042
5	1.426	50	1.125
10	1.169	55	1.293
15	0.964	60	1.277
20	0.816	80	0.884
25	0.721	90	0.547
30	0.718	95	0.449
35	0.755	100	2.683
40	0.843		

Results at 25°.

Vol. % C_2H_5OH.	Gms. $C_6H_2(NO_2)_3ONa$ per 100 cc. sat. sol.	Vol. % C_2H_5OH.	Gms. $C_6H_2(NO_2)_3ONa$ per 100 cc. sat. sol.
0	4.280	50	3.409
5	3.741	55	3.313
10	3.326	60	3.245
15	3.017	65	3.047
20	2.816	70	2.777
25	2.744	75	2.465
30	2.789	80	1.948
35	2.994	85	1.537
40	3.145	90	1.247
45	3.313	95	0.873
		100	4.438

SODIUM STANNATE $Na_2Sn(OH)_6$ and $Na_2Sn(OH)_6.H_2O$.

Solubility of Anhydrous and of Hydrated Sodium Stannate in Water. (Zocher, 1920.)

t°.	−5.	0.	+21.	25.	35.	45.	50.
Gms. per 100 gms. sat. sol. Solid Phase $Na_2Sn(OH)_6$	31.8	31.5	30.4	30.3	29.4	26.6	–
Gms. per 100 gms. sat. sol. Solid Phase $Na_2Sn(OH)_6.H_2O$	32.4	33.2	35.4	36.5	37.5	39.2	41.1

SODIUM SULFATE $Na_2SO_4.10H_2O$.

Freezing-Points of Dilute Aqueous Solutions of Sodium Sulfate.

(Klein and Svanberg, 1920.)

t° of f. pt.....	—0.470.	—1.057.	—1.865.
Normality of Aq. Na_2SO_4.....	0.1	0.25	0.50

Solubility of Sodium Sulfate in Water.

(Richards and Yngve, 1918.)

The determinations were made with the highest possible degree of accuracy. The solid phase was $Na_2SO_4.10H_2O$ in all cases. The temperatures refer to the Paris hydrogen scale.

t°.	Gms. Na_2SO_4 per 100 gms. H_2O.	t°.	Gms. Na_2SO_4 per 100 gms. H_2O.	t°.	Gms. Na_2SO_4 per 100 gms. H_2O.
15.000...	13.181	19.000...	17.698	23.000...	23.888
16.000...	14.185	20.000...	19.064	24.000...	25.762
17.000...	15.268	21.000...	20.549	25.000...	27.795
18.000...	16.437	22.000...	22.155		

The following determinations are given by Nishizawa, 1920.

t°.	Gm. mols. Na_2SO_4 per 1000 gms. mols. H_2O.	Gms. Na_2SO_4 per 100 gms. H_2O.	Solid Phase.
15.....	16.61	13.10	$Na_2SO_4.10H_2O$
30.....	52.01	41.02	»
40.....	61.01	48.10	Na_2SO_4

Data for the effect of various salts upon the transition temperature of $Na_2SO_4.10H_2O$ are given by Norton and Johnston, 1926.

Solubility of Sodium Sulfate in Aqueous Solutions of Ammonia at 35°

(Fedotieff and Kolosoff, 1923.)

d of sat. sol.	Gms. per 100 cc. sat. sol.		Gms. per 100 gms. H_2O.	
	Na_2SO_4.	NH_3.	Na_2SO_4.	NH_3.
1.202.....	28.76	4.84	33.23	5.65
1.169.....	25.39	6.08	29.71	6.49
1.137.....	21.98	6.59	25.83	7.75

Equilibrium in the System Sodium Sulfate, Sodium Sulfide and Water.

(Hogg, 1926.)

The attainment of equilibrium was effected by (1) cooling homogeneous solutions from higher temperatures and, when necessary, innoculating with the appropriate solid phase (systems at 0°.1 and 18°, (2) heating hetereogeneous systems from lower temperatures (systems at 25° and 31°) (3) evaporating homogeneous solutions under reduced pressure at the temperature of the experiment (40°) untill sufficient solid appeared. When all phases were present the tubes were mechanically rotated in a thermostat for from 4 to 40 hours. The saturated solutions and moist solid phases were analyzed. M. C. with formula, indicates mixed crystals and the major constituent.

Results at 0°.1.

$d_{\frac{0.1}{t}}$ of sat. sol.	Gms. per 100 gms. sat. sol. Na_2SO_4.	Gms. per 100 gms. sat. sol. Na_2S.	Solid Phase.
1.041	2.99	1.44	M.C.$Na_2SO_4.10H_2O$
1.052	2.11	3.16	»
1.066	1.68	4.79	»
1.081	1.54	6.16	»
1.091	1.48	7.36	»
1.099	1.28	8.32	»
1.110	1.27	9.49	»
1.124	1.24	10.77	»
1.129	1.19	11.11	»
1.132	1.18	11.23	M.C.$Na_2SO_4.10H_2O$ + M.C.$Na_2S.10H_2O$
1.129	1.23	11.18	M.C.$Na_2SO_4.10H_2O$ + M.C.$Na_2S.10H_2O$
1.129	1.16	11.16	» »
1.131	1.19	11.23	» »
1.130	1.25	11.14	» »
1.131	1.23	11.21	» »
1.137	1.16	11.94	M.C.$Na_2S.10H_2O$
—	0.93	11.22	»
1.125	0.63	11.34	»
1.122	0.0	11.33	»

EQUILIBRIUM IN THE SYSTEM SODIUM SULFATE, SODIUM SULFIDE AND WATER (CON.)
(Hogg, 1926.)

d of sat. sol.	Gms. per 100 gms. sat. sol. Na_2SO_4.	Gms. per 100 gms. sat. sol. Na_2S.	Solid Phase.
	Results at 18°.		
1.126	13.31	0.62	$Na_2SO_4.10H_2O$
1.126	11.91	1.51	»
1.131	10.67	2.84	»
1.130	9.30	4.54	»
1.132	9.05	5.33	»
1.143	8.09	6.82	»
1.149	7.64	7.99	»
1.162	7.15	9.47	»
1.165	9.96	7.09	»
1.167	7.17	10.04	»
1.175	6.96	10.91	»
1.186	6.93	12.14	»
1.208	7.01	13.08	»
1.225	9.75	13.15	»
1.210	7.24	13.95	» $+M.C.Na_2S.9H_2O$
1.212	7.21	13.90	» »
–	6.44	13.98	$M.C.Na_2S.9H_2O$
1.212	5.83	14.02	»
1.197	5.20	14.50	»
1.187	3.47	15.08	»
–	2.28	15.33	»
	0.53	15.65	»
1.169	–	15.95	$Na_2S.9H_2O$
	Results at 25°.		
–	19.71	1.63	$Na_2SO_4.10H_2O$
1.203	17.84	3.27	»
1.204	17.12	4.40	»
1.241	14.67	9.96	» $+Na_2SO_4$
1.241	14.70	9.96	» »
1.241	14.51	10.04	Na_2SO_4
1.237	12.50	11.21	»
1.222	10.80	12.68	»
1.228	8.06	14.68	»
1.221	6.32	16.07	» $+Na_2S.9H_2O$
1.224	6.87	15.87	» »
1.229	7.18	15.84	» »
1.205	5.01	16.61	$Na_2S.9H_2O$
1.202	3.40	17.17	»
1.183	0.0	17.86	»

d of sat. sol.	Gms. per 100 gms. sat. sol. Na_2SO_4.	Gms. per 100 gms. sat. sol. Na_2S.	Solid Phase.
	Results at 31°.		
1.285	29.97	0.40	$Na_2SO_4.10H_2O$
1.294	29.15	1.47	»
1.291	28.72	2.43	»
1.290	28.65	2.31	» $+Na_2SO_4$
1.288	27.39	2.85	» »
1.264	23.06	4.81	Na_2SO_4
1.248	19.47	6.97	»
–	18 92	7.47	»
1.228	14.46	9.83	»
1.219	11.56	12.14	»
1.214	8.59	14.39	»
–	6.58	16.36	»
1.214	4.79	18.69	»
1.253	2.56	22.22	»
1.222	4.32	19.69	» $+Na_2S.9H_2O$
1.229	4.04	19.33	» »
–	3.04	19.57	$Na_2S.9H_2O$
1.210	1.05	20.44	»
1.202	0.0	20.69	»
	Results at 40°.		
1.302	28.90	1.32	Na_2SO_4
	24.43	3.56	»
1.260	20.25	6.18	»
–	15.23	9.49	»
1.236	14.14	9.78	»
1.223	8.72	14.25	»
–	7.37	14.97	»
1.223	6.53	15.45	»
–	5.22	14.08	»
1.233	3.41	20.36	»
1.239	2.79	21.27	»
1.223	1.91	23.04	»
1.253	1.84	23.57	»
1.248	1.90	23.72	» $+Na_2S.9H_2O$
1.256	1.62	24.25	» »
1.238	0.88	23.93	$Na_2S.9H_2O$
1.236	0.49	24.06	»
1.248	0.0	25.01	»
1.248	0.0	25.09	»

The following transition points were also determined.

	Transition.	t°.	$d\frac{t°}{4}$ of sat. sol.	Gms. per 100 gms. sat. sol. Na_2SO_4.	Gms. per 100 gms. sat. sol. Na_2S.
Binary..	$Na_2S.10H_2O \rightleftharpoons Na_2S.9H_2O$.....	4.7..	1.128	–	12.46
Ternary.	The above in sat. Na_2SO_4.....	2.3..	1.135	1.40	11.49
»	$Na_2SO_4.10H_2O \rightleftharpoons Na_2SO_4$ in sat. Na_2S.	20.9..	–	9.48	13.41
»	?	–	1.331	4.48	19.97

In all cases the densities were measured at the temperature of the experiment.

Equilibrium in the System Sodium Sulfate, Sodium Sulfite and Water.

(Rivett and Lewis, 1923.)

Constant agitation was employed for assuring saturation. The solutions and solid phases were analyzed and the compositions of the latter identified by the « rest method ». At 25° both a stable and a metastable system exists, and each was determined. The solid phases in contact with the solutions corresponding to the two branches of the stable system were respectively a series of mixed crystals of $Na_2SO_4.10H_2O + Na_2SO_3.10H_2O$ and $Na_2SO_4.7H_2O + Na_2SO_3.7H_2O$. The solid phases for the two branches of the metastable system were mixed crystals of anhydrous sulfite and sulfate.

Results at 25° for the Stable System.

$d_{\frac{25}{4}}$ of sat. sol.	Gms. per 100 gms. sat. sol. Na_2SO_4.	Gms. per 100 gms. sat. sol. Na_2SO_3.
1.211...	20.40	2.53
1.227...	19.66	4.11
1.239...	18.11	6.59
1.258...	17.31	9.22
1.269...	16.43	11.39
1.292...	15.25	14.61
1.311...	14.55	16.80
1.312...	14.49	16.81
— ...	11.05	18.27
1.274...	8.97	19.44
1.250...	4.14	21.61
— ...	0.00	23.75

Results at 25° for the Metastable System.

$d_{\frac{25}{4}}$ of sat. sol.	Gms. per 100 gms. sat. sol. Na_2SO_4.	Gms. per 100 gms. sat. sol. Na_2SO_3.
1.347...	20.51	14.39
1.347...	19.12	15.43
1.347...	17.82	16.94
1.347...	16.32	18.34
— ...	16.18	18.52
1.346...	13.82	20.35
— ...	12.34	21.88
1.346...	10.93	23.40
1.340...	7.47	26.32
1.322...	6.75	25.45
1.302...	3.99	26.57
1.285...	1.69	27.29

The authors also determined the isotherms for 0°.1, 17°.5 and 37°.5. At the latter temperature the solid phases were mixed crystals of the anhydrous salts. In subsequent papers by Lewis and Rivett, 1924, data are given for many other isotherms. By extrapolation of these results to zero content of sodium sulfate solubility results for pure sodium sulfite hepta hydrate were obtained. These when plotted together with the determinations of Hartley and Barrett, 1909 (see « Solubilities », p. 673) agreed satisfactorily and give confidence in the extrapolation method of estimating the solubility of sodium sulfite heptahydrate. When, however, the extrapolated values obtained by use of commercial anhydrous sodium sulfite (already containing sulfate), were compared with the results of Hartley and Barrett, determined upon perfectly pure sulfite, a considerable difference was found. Thus, the transition temperature was 31°.5 at 27.2 per cent concentration of Na_2SO_3 instead of 22° at 22.0 per cent Na_2SO_3, as found by Hartley and Barrett. The other estimated values for the solubility of anhydrous sodium sulfite were :

t°.....	33.0.	37.5.	42.5.	47.5.	52.5.	57.5.	62.5.	67.5.
Wt. % Na_2SO_3.....	26.8	26.3	25.7	25.25	24.7	24.1	23.6	23.2

The authors surmised « that the marked discrepancy is due to the mixed crystals of sulfite and sulfate corresponding, in the limiting case of zero sulfate, with a form of sodium sulfite which is metastable to that obtained as a pure salt by Hartley and Barrett's method ». A complete examination of the whole ternary system, at temperatures where only the anhydrous solids appeared, was then made. The results showed that these two salts are capable of mixing in quite a number of distinct series of mixed crystals of varying stabilities. More than 80 solutions were prepared at 40°, 45° and 60° by more or less complicated methods, involving evaporation of unsaturated solutions of suitable concentrations to yield the solid phases in desired quantity at the temperature of the experiment. The analytical results, when plotted, show that there are no fewer than five solution curves and five corresponding series of mixed crystals. The precise limits of these are uncertain « but the error is not sufficient to affect the general conclusions ».

EQUILIBRIUM IN THE SYSTEM SODIUM SULFATE, SODIUM THIOSULFATE AND WATER.

(Garran, 1926.)

Saturation was obtained by constant agitation in a thermostat for from 3 to 24 hours. M. C. indicates mixed crystals and the formula following shows the major constituent. * indicates metastable equilibrium.

d of sat. sol.	Gms. per 100 gms. sat. sol. Na_2SO_4.	Gms. per 100 gms. sat. sol. $Na_2S_2O_3$.	Solid Phase.
Results at 0°.8.			
1.040	4.60	0.0	$Na_2SO_4.10H_2O$
1.065	3.13	4.48	M.C.$Na_2SO_4.10H_2O$
1.105	2.31	9.63	»
1.159	1.88	16.03	»
1.190	1.87	19.62	»
1.247	1.56	25.63	»
–	1.34	30.07	»
1.312	1.27	32.26	»
1.324	1.58	33.91*	»
1.314	1.22	32.72	»+M.C.$Na_2S_2O_3.5H_2O$
1.317	1.15	32.72	
1.317	1.44	32.72	M.C.$Na_2S_2O_3.5H_2O$
1.315	–	33.57	$Na_2S_2O_3.5H_2O$
Results at 18°.			
1.130	14.11	0.0	$Na_2SO_4.10H_2O$
1.150	12.31	4.01	M.C.$Na_2SO_4.10H_2O$
1.180	10.71	9.36	»
1.194	9.83	11.34	»
1.225	8.45	15.86	»
1.248	7.65	19.16	»
1.276	7.14	22.46	»
1.301	6.01	25.53	»
1.314	5.97	27.00	»
1.338	6.04	29.57	»
1.356	6.32	32.31	»
1.374	5.94	33.66	»
1.390	6.14	35.07	»
1.399	6.26	35.42	»+M.C.$Na_2S_2O_3.5H_2O$
1.394	6.31	35.46	M.C.$Na_2S_2O_3.5H_2O$
1.395	4.87	36.61	»
1.384	1.65	39.12	»
1.378	0.0	40.36	$Na_2S_2O_3.5H_2O$
Results at 25°.			
1.204	21.60	0.0	$Na_2SO_4.10H_2O$
1.215	19.74	3.48	M.C.$Na_2SO_4.10H_2O$
1.236	18.44	7.30	»
1.253	17.12	10.14	»
1.271	16.13	13.22	»
1.288	14.86	16.16	»
1.311	13.97	19.35	»
–	13.62	22.02	»
1.359	12.97	24.96	»
–	12.72	26.86	M.C.$Na_2SO_4.10H_2O$
–	12.72	26.85	+M.C.Na_2SO_4
–	13.27	26.12*	M.C.Na_2SO_4
1.379	12.15	28.00	»
–	10.28	30.31	»
1.401	7.73	34.72	»
–	6.06	38.07	»
–	4.53	41.86*	»
1.453	4.87	43.32*	»
–	5.59	38.83	
–	5.66	38.67	M.C.Na_2SO_4
1.426	5.64	38.97	+M.C.$Na_2S_2O_3.5H_2O$
1.420	5.42	38.85	
–	5.20	38.96	
1.418	4.69	39.45	M.C.$Na_2S_2O_3.5H_2O$
1.412	3.13	40.92	»
1.411	2.01	41.53	»
1.410	0.23	43.52	»
–	0.0	43.50	$Na_2S_2O_3.5H_2O$
Results at 40°.			
–	32.37	0.0	Na_2SO_4
–	29.35	3.79	M.C.Na_2SO_4
1.326	24.79	9.06	»
1.334	18.58	16.73	»
–	14.76	22.95	»
1.367	11.14	28.06	»
–	10.40	30.44	»
1.383	8.13	34.35	»
–	5.90	39.74	»
1.444	4.28	43.06	»
1.484	2.46	48.78	»
	1.79	51.04*	»
	2.03	52.10*	»
1.496	2.27	49.38	
1.496	2.08	49.72	M.C.Na_2SO_4
1.494	2.24	49.73	+M.C.$Na_2S_2O_3.5H_2O$
	2.09	49.97	
	3.61	49.60*	M.C.$Na_2S_2O_3.5H_2O$
1.493	2.14	49.88	»
–	2.45	49.98	»
–	1.58	50.15	»
1.492	0.67	50.49	»
1.488	0.0	51.23	$Na_2S_2O_3.5H_2O$

Equilibrium in the System Sodium Sulfate, Sulfuric Acid and Water.

(Pascal and Ero, 1919; Faust and Esselmann, 1926; Foote, 1919).

t°.	Gms. per 100 gms. sat. sol. Na_2SO_4.	Gms. per 100 gms. sat. sol. H_2SO_4.	Solid Phase.
Results by Pascal and Ero.			
—45...	1.6	42.8	$Na_3H(SO_4)_2 + Na_2SO_4.10H_2O$
—30...	1.6	42.8	$Na_3H(SO_4)_2$
—30...	2.30	37.10	»
—30...	3.10	26.80*	»
—24...	3.0	30.0	Ice
—24...	7.5	35.0	Ice + $Na_3H(SO_4)_2 + Na_2SO_4.10H_2O$
—21...	7.5	40.0	$NaHSO_4.H_2O$
— 1...	7.5	40.0*	»
—17...	3.0	24.25	Ice
—11...	10.0	30.0	$Na_2SO_4.10H_2O$
—10...	5.0	15.0	» + Ice
— 9...	3.0	12.5	Ice
— 7...	10.0	22.5	$Na_2SO_4.10H_2O$
— 6...	4.0	45.0	$Na_3H(SO_4)_2$
— 3...	9.1	32.1*	$NaHSO_4.H_2O$
— 3...	10.25	10.9	$Na_2SO_4.10H_2O$
— 3...	16.0	27.1	$Na_2H(SO_4)_2$
— 3...	20.1	22.4	»
Results by Faust and Esselmann at 0°.			
	5.98	6.74	
	7.9	14.75	
	11.5	20.5	
	14.44	21.64	$Na_2SO_4.10H_2O$
	20.01	21.69	»
	23.01	21.52	»
	28.3	22.07	»
	27.85	22.66	$Na_3H(SO_4)_2$
	26.25	23.81	
	25.70	24.13	
	22.95	26.08	$Na_3H(SO_4)_2.H_2O$
	18.67	29.35	»
	16.45	30.74	$NaHSO_4.H_2O$
	13.88	32.73	»
	13.01	33.13	
	9.62	34.59	
	7.66	37.21	
	3.98	43.31	$NaHSO_4.H_2O$
	2.11	57.5	
	2.38	58.46	$NaHSO_4.H_2O$
	2.79	60.00	
	3.05	61.30	
	3.44	62.60	$NaHSO_4$
	3.36	62.87	
	0.0	69.90	
Results by Pascal and Ero at 5°.0.			
	13.94	8.75	$Na_2SO_4.10H_2O$
	25.55	14.96	»
	33.30	16.70	» + Na_2SO_4
	25.74	25.05	$Na_3H(SO_4)_2$
	16.23	33.60	»
	4.95	45.90	» + $NaHSO_4.H_2O$
	4.19	48.60	$NaHSO_4.H_2O$
	3.96	58.78	$NaHSO_4$
	0.95	70.80	»
	0.19	81.70	$NaH_3(SO_4)_2.1\frac{1}{2}H_2O$
	3.02	88.70	»
Results by Foote at 12°.0.			
	9.53	0.0	$Na_2SO_4.10H_2O$
	32.93	16.51	» + $Na_3H(SO_4)_2$
	25.41	27.96	$NaHSO_4.H_2O + Na_3H(SO_4)_2$
	4.33	58.79	$NaH(SO_4)_2.H_2O$ (divariant)
Results by Pascal and Ero at 14°.0.			
	25.9	0.0	$Na_2SO_4.7H_2O$
	34.15	9.5	»
	19.81	7.13	$Na_2SO_4.10H_2O$
	28.50	13.40	»
	33.35	20.19	Na_2SO_4
	28.58	24.54	$Na_3H(SO_4)_2$
	22.77	29.97	»
	17.74	33.88	»
	5.63	48.12	$NaHSO_4.H_2O$
	4.54	58.68	$NaHSO_4$
	8.68	58.68*	$NaHSO_4.H_2O$
	2.09	63.78	$NaHSO_4$
	1.20	70.76	»
	0.35	81.66	$NaH_3(SO_4)_2.1\frac{1}{2}H_2O$
	0.32	81.68	»
	3.44	87.92	$NaH_3(SO_4)_2$
	3.64	88.30	»
	5.95	91.69*	$NaH_3(SO_4)_2.1\frac{1}{2}H_2O$
	15.05	85.00	$NaH_3(SO_4)_2$
	33.70	23.30 (15°)	$Na_3H(SO_4)_2$
Results by Pascal and Ero at 23°.			
	29.29	10.11	$Na_2SO_4.10H_2O$
	35.52	13.37	»
	34.05	13.56	» + Na_2SO_4
	34.65	19.38	Na_2SO_4
	30.08	26.61	$Na_2H(SO_4)_2$
	9.42	43.76	»
	6.23	56.09	$NaHSO_4.H_2O + NaHSO_4$
	2.78	63.93	$NaHSO_4$
	7.54	64.06*	$NaHSO_4.H_2O$
	1.84	79.40	$NaH_3(SO_4)_2.1\frac{1}{2}H_2O$
	14.74	83.89	$NaH_3(SO_4)_2$
	3.95	87.29	» + $NaH_3(SO_4)_2.1\frac{1}{2}H_2O$

* = Metastable.

EQUILIBRIUM IN THE SYSTEM SODIUM SULFATE, SULFURIC ACID AND WATER (CON.). (Pascal and Ero, 1919; Faust and Esselmann, 1926; Foote, 1919.)

Gms. per 100 gms. sat. sol. Na_2SO_4.	Gms. per 100 gms. sat. sol. H_2SO_4.	Solid Phase.
Results by Foote at 25°.		
21.90	0.0	$Na_2SO_4.10H_2O$
33.48	8.62	» $+Na_2SO_4$
35.36	16.27	$Na_3H(SO_4)_2$+ »
27.02	30.58	» $+NaHSO_4.H_2O$
6.54	56.25	$NaHSO_4.H_2O$ (divariant)
Results by Faust and Esselmann at 29°.5.		
32.22	3.06	$Na_2SO_4.10H_2O$
32.89	3.99	Na_2SO_4
32.84	5.18	»
32.60	6.99	»
32.42	8.94	»
32.51	10.05	»
33.34	13.83	»
33.75	14.38	»
34.02	15.60	»
34.37	17.31	»
33.49	19.10	$Na_3H(SO_4)_2$
33.19	19.49	»
32.69	21.45	»
32.38	22.35	»
30.86	24.98	»
29.79	27.35	»
28.72	29.89	»
28.32	30.60	»
27.81	32.53	
26.87	32.64	
26.54	32.79	$NaHSO_4.H_2O$
19.62	36.65	»
19.00	37.22	»
10.51	45.50	»
8.96	48.15	»
8.35	49.49	»
7.85	55.13	» $+NaHSO_4$
5.70	59.96	$NaHSO_4$
4.59	62.55	
4.31	65.55	
12.7	82.91	
9.3	84.25	
Results by Pascal and Ero at 36°.0.		
35.54	19.31	Na_2SO_4
32.98	26.46	$Na_3H(SO_4)_2$
37.89	26.98*	Na_2SO_4
17.61	42.34	$NaHSO_4.H_2O$
12.53	53.07	»
6.05	65.41	$NaHSO_4$
18.09	86.96	$NaH_3(SO_4)_2$
6.69	86.20	»
Results by Faust and Esselmann at 46°.0.		
32.4	3.47	Na_2SO_4
32.54	6.27	»
32.52	6.8	»
33.01	10.8	»
34.08	14.4	»
34.17	14.9	»
34.14	14.87	»
34.57	15.86	»
34.60	16.17	»
36.00	18.08	»
35.94	18.12	»
35.63	19.18	
35.45	20.16	
34.97	21.32	
34.73	22.93	
34.52	23.04	
34.40	24.60	$Na_3H(SO_4)_2$
33.59	27.2	»
33.25	28.48	»
33.15	29.3	»
33.07	30.18	»
33.01	33.16	»
33.27	33.44	»
33.22	33.08	»
33.25	35.36	$NaHSO_4.H_2O$
32.65	35.70	»
30.95	36.5	»
21.2	43.9	»
20.5	44.52	»
19.85	45.17	»
17.71	48.5	»
17.76	48.32	»
17.13	49.6	»
14.21	51.31	$NaHSO_4$
12.41	52.65	»
10.2	55.5	»
9.93	56.0	»
6.82	61.79	»
6.4	62.46	»
6.16	64.8	»
6.04	65.59	
4.51	67.75	
2.3	74.83	(?)
7.5	72.16	
1.92	78.58	
13.22	80.44	(?)

* = Metastable.

Equilibrium in the System Sodium Sulfate, Sulfuric Acid and Water (con.).

(Pascal and Ero, 1919; Faust and Esselmann, 1926.)

Gms. per 100 gms. sat. sol. Na_2SO_4.	Gms. per 100 gms. sat. sol. H_2SO_4.	Solid Phase.
Results by Pascal and Ero at 56°.		
34.63	8.47	Na_2SO_4
34.99	12.81	»
36.65	18.69	»
36.88	25.10	$Na_3H(SO_4)_2$
40.51	33.21*	$NaHSO_4.H_2O$
19.86	51.15	»
33.00	41.35	»
11.57	60.45	$NaHSO_4$
8.44	62.72	»
5.24	74.63	$NaHSO_4.H_2O$
5.68	76.54	$NaH_3(SO_4)_2.1\ ^1/_2H_2O$
4.49	78.30	»
21.54	78.46	$NaH_3(SO_4)_2$
15.20	81.15	»
9.30	83.25	»
Result by Faust and Esselmann at 60°.		
32.27	4.66	Na_2SO_4
33.70	13.13	»
34.26	14.71	»
37.03	19.00	»
36.86	22.1	$Na_3H(SO_4)_2$
36.48	25.6	»
37.0	29.87	»
38.22	34.26	»
33.04	41.77	»
31.24	42.53	$NaHSO_4$
17.72	51.25	»
13.27	55.36	»
8.22	63.75	»
8.21	67.79	»
11.33	73.65	
16.60	77.78	
15.93	78.6	
3.2	78.69	(?)
3.3	79.32	
13.59	80.8	
5.14	81.01	$NaHSO_4$
Results of Pascal and Ero at 75°.		
41.80	23.10	$Na_2SO_4 + Na_3H(SO_4)_2$
42.40	31.80	$Na_3H(SO_4)_2$
20.10	55.20	$NaHSO_4 + NaHSO_4.H_2O$
11.10	63.40	$NaHSO_4$
12.30	69.80	»
13.40	77.40	$NaH_3(SO_4)_2$
24.90	75.30	»
Results of Faust and Esselmann at 82°.5.		
31.72	6.49	Na_2SO_4
32.83	10.48	»
36.44	16.88	»
38.63	19.73	»
38.85	20.20	»
39.20	25.0	$Na_3H(SO_4)_2$
40.63	28.86	»
41.24	30.17	»
42.25	32.15	»
44.20	35.15	»
45.37	36.14	»
46.20	36.55	»
39.02	41.04	$NaHSO_4$
34.80	44.00	»
28.78	47.55	»
23.62	50.64	»
25.5	49.78	»
20.84	53.9	»
19.42	54.35	»
16.45	56.99	»
10.97	65.07	»
11.9	65.5	»
24.67	71.38	(?)
10.56	71.44	(?)
10.06	72.26	
21.43	73.00	
19.37	73.12	
11.47	75.44	
11.20	75.73	
Results by Pascal and Ero at 97°.		
34.89	8.53	Na_2SO_4
44.34	15.03	»
44.22	20.22	»
44.37	24.02	$Na_3H(SO_4)_2$
44.13	31.91	»
44.10	33.10	»
48.29	34.20	»
51.89	35.53	$NaHSO_4.H_2O$
37.78	42.97	$NaHSO_4$
21.02	56.60	»
15.88	61.92	»
15.60	65.00	»
20.43	68.09	»
21.71	70.98	$NaH_3(SO_4)_2$
29.43	71.16	»
27.60	72.50	$2NaHSO_4.H_2SO_4$
18.0	73.20*	$NaHSO_4$

* = Métastable.

EQUILIBRIUM IN THE SYSTEM SODIUM SULFATE, SULFURIC ACID AND WATER (CON.).
(Pascal and Ero, 1919.)

t°.	Gms. per 100 gms. sat. sol. Na_2SO_4.	Gms. per 100 gms. sat. sol. H_2SO_4.	Solid Phase.	t°.	Gms. per 100 gms. sat. sol. Na_2SO_4.	Gms. per 100 gms. sat. sol. H_2SO_4.	Solid Phase.
120...	49.00	32.67	$Na_3H(SO_4)_2$	169.5.	50.20	44.75	$NaHSO_4$
120...	50.10	34.50	»	159.5.	47.23	48.67	»
120...	53.20	36.50	$NaHSO_4$	160.5.	45.00	49.20	»
120...	32.26	51.20	»	149.5.	40.41	52.09	»
120...	26.80	57.70	»	91.5.	45.00	38.50	$NaHSO_4.H_2O$
120...	27.50	64.55	»	>145...	45.00	33.00	Na_2SO_4
120...	35.61	64.58	»	>170...	57.20	29.05	»

Freezing-point data for mixtures of sodium sulfate and sulfuric acid are given by Kendall and Landon, 1920, and Cambi and Bozza, 1923. Results for mixtures of sodium pyrosulfate and sodium bisulfate are given by Cambi and Bozza, 1923

EQUILIBRIUM IN THE SYSTEM SODIUM SULFATE, SULFURIC ACID AND ETHYL ALCOHOL.
(Dunnicliff and Hoon, 1926.)

The authors studied the action of alcohol upon sodium hydrogen sulfate and found that the maximum concentration of acid obtained in the liquid phase was 17.75 per cent. With quantities of salt necessary to yield higher concentrations it was impossible to separate the liquid phase and the « Rest ». Hence the system could not be further investigated by this method. They then studied the action of alcoholic sulfuric acid solutions upon sodium sulfate and sodium hydrogen sulfate. The experimental results are not presented in a manner which can be easily understood.

SOLUBILITY OF SODIUM SULFATE IN PURE HYDROGEN PEROXIDE.
(Maass and Hatcher, 1922.)

The temperatures were determined at which the last trace of solid dissapeared from mixtures of accurately weighed amounts of the two compounds.

t°.	Gms. Na_2SO_4 per 100 gms. mixture.	t°.	Gms. Na_2SO_4 per 100 gms. mixture.	t°.	Gms. Na_2SO_4 per 100 gms. mixture.
—2.17.....	1.19	— 5.52.....	10.23	+19 6.....	22.64
—2.87.....	2.56	— 6.77.....	13.51	29.1.....	23.59
—3.12.....	4.47	— 9.02.....	16.77	39.1.....	25.62
—4.27.....	6.92	—10.57.....	19.47		

SODIUM Phenyl **SULFATE** $C_6H_5O_4SNa.3H_2O$.

100 gms. sat. solution in water contain 31.0 gms. of the compound at 17°.
» » alcohol » 7.0 » »
(Burkhardt and Lapworth, 1926.)

SODIUM N-Phenyl β Aminoethyl Hydrogen **SULFATE**
$C_6H_5NH.C_2H_4OSO_3Na.H_2O$.

100 cc. sat. solution in water contain approx. 60 gms. of the compound at 15°.
(Saunders, 1922.)

SODIUM SULFIDE $Na_2S.9H_2O$.

SOLUBILITY OF SODIUM SULFIDE IN WATER, DETERMINED BY THE FREEZING-POINT METHOD. (Sanfourche and Liebaut, 1922.)

The authors results were plotted and the following table constructed from the curves.

t°.	Gms. Na_2S per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. Na_2S per 100 gms. sat. sol.	Solid Phase.
— 2..	2.0	Ice	50 tr. pt.....	28.0	$Na_2S.9H_2O+Na_2S.5\ ^1/_2H_2O$
— 5.....	5.0	»	70.....	32.5	$Na_2S.5\ ^1/_2H_2O$
— 9 5 Eutec.	7.5	»+$Na_2S.9H_2O$	90.....	39.5	»
0.....	8.8	$Na_2S.9H_2O$	97.5 m. pt...	45.0	»
10..	10.8	»	90.....	52 5	»
20.....	13.6	»	86 Eutec....	54.5	»+$Na_2S.H_2O$
30.....	17.0	»	90.....	57.8	$Na_2S.H_2O$
40..... ..	21.0	»	95.	60.1	»

SODIUM SULFITE $Na_2SO_3.7H_2O$.

Solubility of Sodium Sulfite in Water.

(Foerster, Brosch and Norberg-Schulz, 1924.)

The determinations were made with exceptional care. The solutions were kept in contact with an atmosphere of hydrogen to prevent oxidation.

t°.	Gms. Na_2SO_3 per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. Na_2SO_3 per 100 gms. sat. sol.	Solid Phase.
— 0.667	1.865	Ice	33.8	28.54 (unstable)	$Na_2SO_3.7H_2O$
— 1.27	3.73	»	34.7	28.86 »	»
— 2.23	6.69	»	35.9	29.89 »	»
— 2.70	8.12	»	34.5	28.20	Na_2SO_3
— 3.45 Eutec.	10.48	»+$Na_2SO_3.7H_2O$	35.6	27.80	»
— 1.30	11.25	$Na_2SO_3.7H_2O$	41.0	27.15	»
0.0	12.59	»	46.0	26.35	»
9.2	15.60	»	50.0	25.75	»
16.5	19.14	»	58.1	24.79	»
19.9	20.82	»	66.0	24.06	»
24.0	22.76	»	70.0	23.85	»
26.85	24.32	»	94.4	21.44	»
28.2	25.36	»	97.0	21.32	»
33.0	27.99	»	99.0	21.70	»
33.4 tr. pt.	—	»+Na_2SO_3			

The above results show that the transition temperature of 21°.6 for $Na_2SO_3.7H_2O \rightleftharpoons Na_2SO_3$ and the solubilities of Na_2SO_3, reported by Hartley and Barrett, 1909, are incorrect.

SODIUM Pyro SULFITE $Na_2S_2O_5.7H_2O$, $Na_2S_2O_5.6H_2O$ (métastable).

Solubility of Sodium Pyrosulfite in Water.

(Foerster, Brosch and Norberg-Schulz, 1924.)

The determinations were made with exceptional care. Equilibrium was approached from above and below. A new preparation of the salt was used for each determination and the composition of the solid phase was determined by analysis in each case. In order to reduce the free sulfur dioxide present, the volume of air space above the saturated solution was kept at a minimum. The two hydrates give solubility curves which are almost parallel. The metastable hexahydrate is very easy to obtain and its equilibrium with the solutions can be readily followed.

t°.	Gms. $Na_2S_2O_5$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $Na_2S_2O_5$ per 100 gms. sat. sol.	Solid Phase.
—0.56	1.435	Ice	— 7.5	24.50	$Na_2S_2O_5.7H_2O$
—2.28	6.40	»	— 5.0	26.15	»
—3.19	9.00	»	0.0	31.10	»
—5.24	14.64	»	+ 1.2	32.45	»
—7.84	20.92	»	5.5 tr. pt.	—	»+$Na_2S_2O_5$
—9.74 Eutec.	24.20	»+$Na_2S_2O_5.6H_2O$	0.0	37.47 (unst.)	$Na_2S_2O_5$
—8.5	24.75	$Na_2S_2O_5.6H_2O$	8.6	38.65	»
—4.2	28.10	»	15.0	39.20	»
—2.2	30.25	»	22.8	39.77	»
0.0	32.90	»	31.4	40.79	»
+1.8	35.40	»	40.2	41.60	»
3.0	37.16	»	59.0	44.27	»
3.8 tr. pt.	—	»+$Na_2S_2O_5$	71.4	45.62	»
—9.05 Eutec.	23.50	Ice+$Na_2S_2O_5.7H_2O$	85.0	47.89	»
—9.0	23.77	$Na_2S_2O_5.7H_2O$	97.2	49.06	»

SOLUBILITY OF SEVERAL SODIUM SULFONATES IN WATER.

Compound.	Formula.	t°.	Gms. anhydrous cmpd. per 100 gms. sat. sol.	
Sodium 10-Chloro 3 or 6 sulfonate.....	$C_{10}H_5ClSO_3Na.H_2O$	20	0.263	(1)
Sodium 2.6.8 Naphthylamine disulfonate....	$C_{10}H_5(NH_2)(SO_3Na)_2$	15	59.04	(2)
» 2.5.7 » » »	»	15	72.2	(2)
» 2.6.8 » » » (acid salt).	$C_{10}H_5(NH_2)(SO_3)_2HNa$	15	7.46	(2)
» 2.5.7 » » » » .	»	15	7.91	(2)

(1) Sandquist, 1917. (2) Braunschweig, 1922.

SODIUM β Naphthalene SULFONATE $C_{10}H_7SO_3Na$.

Data (in the form of triangular diagrams) for the solubility of sodium β naphthalene sulfonate in aqueous solutions of sodium chloride and sodium sulfate at various temperatures between 25° and 65° are given by Cooke, 1921. In one case it is mentioned that 100 gms. of a sat. solution contain 8.47 gms. of the β salt and 2.93 gms. Na Cl at 65°.

SODIUM Di THIONATE $Na_2S_2O_6.2H_2O$.

100 gms. sat. solution of sodium dithionate in water contain 6.05 gms. $Na_2S_2O_6$ at 0°, 10.63 gms. at 12°, 13.39 gms at 20° and 17.32 gms. at 30°. (de Baat, 1926.)

SOLUBILITY OF SODIUM DITHIONATE IN AQUEOUS SOLUTIONS OF STRONTIUM DITHIONATE AT 30° AND VICE VERSA. (de Baat, 1926.)

Gms. per 100 gms. sat. sol. $Na_2S_2O_6$.	Gms. per 100 gms. sat. sol. SrS_2O_6.	Solid Phase.	Gms. per 100 gms. sat. sol. $Na_2S_2O_6$.	Gms. per 100 gms. sat. sol. SrS_2O_6.	Solid Phase.
17.32	0.0	$Na_2S_2O_6.2H_2O$	6.91	12.24	$SrS_2O_6.4H_2O$
14.52	5.55	»	0.0	14.90	»
13.06	10.09	» $+SrS_2O_6.4H_2O$			

SODIUM THIOSULFATE $Na_2S_2O_3.5H_2O$ (I).

SOLUBILITY OF SODIUM THIOSULFATE IN WATER. (Picon, 1924.)

This entire system has been reinvestigated by a method of determination involving the reheating of previously crystallized mixtures of accurately weighed amounts of the constituents, and observing the temperature of dissapearance of the last crystal. The results are, with few exceptions, in very good agreement with the determinations of Young and Burke, 1904, 1906 (« Solubilities », page 674-675) made by the direct analysis of saturated solutions. The present results are given in terms of gram molecules of $Na_2S_2O_3$ per 100 gram. molecules of the mixture.

t°.	Mol. % $Na_2S_2O_3$.
Ice Curve.	
— 1.8...	0.85
— 4.3...	2.09
— 6.8...	3.40
— 8.6...	4.14
—10.0...	4.50
—10.6...	4.71
—14.0...	5.70
—17.5...	6.56
—22.5...	7.25
$Na_2S_2O_3.12H_2O$ (II) Curve.	
—16.5...	7.49
—16.3...	8.02
$Na_2S_2O_3.10H_2O$ (I) Curve.	
—13.9...	6.01
—11.5...	6.34
$Na_2S_2O_3.10H_2O$ (I) Curve.	
—10.5...	6.56
— 9.5...	7.0
— 9.0...	7.25
— 8.6...	7.49
— 8.2...	8.02
— 7.9...	8.45
$Na_2S_2O_3.6H_2O$ (II) Curve.	
—16.0...	6.24
—13.0...	6.56
— 9.5...	7.00
— 3.0...	8.02
— 0.5...	8.45
+ 3.4...	9.00
8.0...	10.00
12.9...	11.92
$Na_2S_2O_3.5H_2O$ (II) Curve.	
—14.0...	6.34
— 9.0...	6.56
— 2.0...	7.03
+ 2.5...	7.56
5.4...	7.98
14.5...	8.98
20.8...	10.00
25.5...	10.98
28.1...	11.92
30.1...	13.01
$Na_2S_2O_3.5H_2O$ (I) Curve.	
— 4.8...	4.92
— 3.4...	4.94
— 1.0...	5.21
+ 3.6...	5.66
4.5...	5.73
8.5...	6.02
$Na_2S_2O_3.5H_2O$ (I) Curve.	
9.75...	6.23
12.7...	6.43
15.7...	6.87
18.4...	7.01
23.1...	7.64
25.8...	8.02
31 0...	8.59
37.6...	9.68
41.5...	10.97
45.5...	12.50
46.9...	13.46
47.8...	14.28
48.0...	15.02
48.2...	15.72
48 3...	16.55
48.6...	17.35
48.0...	17.80
48.0...	18.15

SOLUBILITY OF SODIUM THIOSULFATE IN WATER (CON.). (Picon, 1924.)

t°.	Mol. % $Na_2S_2O_3$.	t°.	Mol. % $Na_2S_2O_3$.	t°.	Mol. % $Na_2S_2O_3$.	t°.	Mol. % $Na_2S_2O_3$.
$Na_2S_2O_3.4H_2O$ (II) Curve.		$Na_2S_2O_3.H_2O$ (II) Curve.		$Na_2S_2O_3.H_2O$ (I) Curve.		$Na_2S_2O_3$ Curve.	
34.9	14.23	52.5	18.10	60.5	20.06	61.0	19.69
37.9	15.00	59.0	19.20	61.7	20.22	61.7	19.72
39.0	16.05	59.5	19.34	63.75	20.64	67.0	19.90
40.0	16.74	61.4	19.75	65.0	20.84	68.0	19.94
40.1	17.23	62.4	19.84	70.0	21.86	68.5	19.96
$Na_2S_2O_3.2H_2O$ (I) Curve.		63.5	20.19	71.5	22.17	69.5	19.98
		65.4	20.48	72.0	22.26	69.8	20.08
49.6	15.57	66.5	20.79	72.5	22.45	74.0	20.22
56.7	16.81	66.8	20.86	$Na_2S_2O_3.{}^1/_2H_2O$ (I) Curve.		74.6	20.29
59.0	17.40	67.5	21.17			76.5	20.42
61.3	18.23	69.1	21.39	59.5	18.77	79.75	20.48
62.3	18.30	69.5	21.64	63.5	19.06	83.0	20.80
64.9	19.20	$Na_2S_2O_3.H_2O$ (I) Curve.		65.0	19.32	88.0	20.97
65.0	19.20			66.5	19.40	91.0	21.19
65.5	19.40	45.6	17.92	67.2	19.44	93.5	21.30
66.0	19.51	49.5	18.49	69.5	19.75	97.0	21.58
66.5	19.68	51.5	18.62	70.0	19.80	107.0	22.32
66.8	19.71	53.5	19.05	72.0	20.07	112.0	22.60
$Na_2S_2O_3.H_2O$ (II) Curve.		55.5	19.33	75.0	20.44	112.5	22.69
		57.5	19.61	76.0	20.72	114.5	22.91
46.2	17.06	59.0	19.84	88.0	22.26		
51.9	18.08						

SODIUM TUNGSTATE Na_2WO_4.

Fusion-point data for mixtures of Na_2WO_4 and WO_3 are given by Van Liempt, 1925.

SODIUM URATE $C_5H_3N_4O_3Na$.

SOLUBILITY OF SODIUM URATE IN AQUEOUS SOLUTIONS OF $KH_2PO_4 + K_2HPO_4$ AT 37°. (Jung, 1923.)

p_H of aq. phosphate solution.	5.0.	5.6.	6.4.	6.6.	7.0.
Gms. $C_5H_3N_4O_3Na$ per liter of solvent...	0.25	0.675	0.93	1.15	1.13

SODIUM ZINCATE $Na_2O.ZnO.4H_2O$.

EQUILIBRIUM IN THE SYSTEM SODIUM OXIDE, ZINC OXIDE AND WATER AT 30° (Goudriaan, 1919, 1920.)

Especially carefully purified materials were used. The solid phases were determined by the rest method of Schreinemakers. At the zinc hydroxide end of the curve crystallized $Zn(OH)_2$ was used as solid phase and about two weeks allowed for the attainment of final equilibrium.

Gms. per 100 gms. sat. sol.		Solid Phase.	Gms. per 100 gms. sat. sol.		Solid Phase.
Na_2O.	ZnO.		Na_2O.	ZnO.	
11.8	2.6	ZnO	39.4	9.0	$Na_2O.3H_2O$
17.4	5.0	»	39.6	7.2	»
23.7	11.3	»	40.7	2.0	»
27.3	16.0	»	40.5	1.6	»
27.8	16.5	» + $Na_2O.ZnO.4H_2O$	40.9	1.1	»
28.0	14.9	$Na_2O.ZnO.4H_2O$	41.9	0.0	»
30.1	13.2	»	24.6	12.5	ZnO
31.8	11.7	»	19.9	15.2	$Zn(OH)_2$
33.2	11.2	»	13.7	7.2	»
34.7	10.4	»	10.1	4.7	»
36.1	10.2	»	4.6	1.0	»
39.2	9.7	» + $Na_2O.3H_2O$	4.5	0.4	ZnO

SOLANINE (See, p. 1408).

SPARTEINE $C_{15}H_{26}N_2$.

Solubility of Sparteine in Water and in Aqueous 5 per cent Solutions of Sodium Carbonate. (Valeur, 1917, 1919.)

The temperatures were determined at which clouding occurs in solutions of sparteine in water and in aqueous 5% Na_2CO_3 solutions. Recently distilled sparteine of rotation $-2°\,46''$ in a 5 dcm tube was used.

Results for water		Results for Aq. 5 % Na_2CO_3 solutions			
t° of clouding.	Gms. $C_{15}H_{26}N_2$ per 100 cc. sat. sol.	t° of clouding	Gms. $C_{15}H_{26}N_2$ per 100 cc. sat. sol.	t° of clouding.	Gms. $C_{15}H_{26}N_2$ per 100 cc. sat. sol.
10.8.....	0.556	23.4.....	0.21	39.8.....	0.12
12.5.....	0.496	24.0.....	0.19	43.5.....	0.105
18.0.....	0.32*	25.0.....	0.18	47.0.....	0.09
22.0.....	0.31	28.6.....	0.165	53.0.....	0.075
32.0.....	0.28	33.5.....	0.15	60.2.....	0.060
38.0.....	0.20	36.5.....	0.135	72.5.....	0.045
50.0.....	0.18				

*This determination made by direct saturation and analysis of the solution by précipitation of the sparteine as picrate or phosphotungstate.

STEARIC ACID $CH_3(CH_2)_{16}COOH$.

Solubility of Stearic Acid in Aqueous Ethyl Alcohol Solutions. (Thomas and Yu, 1923; Thomas and Mattikow, 1926.)

Wt. % C_2H_5OH in solvent.	d_4^{25} of Solvent.	Gms. $CH_3(CH_2)_{16}COOH$ per 100 cc. sat. solution at		
		0° ± 1°.0 (*a*).	10° ± 0°.5 (*b*).	25° ± 0°.05 (*c*).
63.07	0.8778	–	0.031	0.087
86.16	0.8236	0.061	0.232	1.014
91.53	0.8094	0.113	0.396	1.803

(*a*) The mixtures were shaken 4 times daily for 5 1/2 days and the determinations repeated ofter another period of 5 1/2 days.

(*b*) The mixtures were shaken 2 times daily for 10 days and the determinations repeated ofter another period of 3 days.

(*c*) Saturation was obtained by constant agitation in a thermostat.

100 gms. methyl formate dissolve 1.3 gms. stearic acid at 25°. (Kröber, 1919.)

STEARIC ANHYDRIDE $(C_{17}H_{35}CO)_2O$.

100 gms. abs. alcohol dissolve 0.023 gm. stearic anhydride at 20°. (Whitby, 1926.)

STEARIN (Tristearin) $C_3H_5((O.C_{18}H_{35}O)_3$.

100 gms Abs. Alcohol dissolve 13.0 gms stearin at 20-25°. (Pucher and Dehn, 1921.)
» Quinoline » 5.35 » » » »

STRONTIUM BENZOATES.

Solubility of Several Strontium Benzoates in Water at 20°. (Ephraim and Pfister, 1925.)

Compound.	Formula.	Gms. anhydrous compd. per 100 cc. sat. sol.
Strontium Benzoate.....	$(C_6H_5COO)_2Sr.H_2O$	4.953
» -4 Chloro Benzoate..	$(C_6H_4ClCOO)_2Sr.4H_2O$	1.341
» -4 Methoxy »	$(C_6H_4OCH_3COO)_2Sr.H_2O$	1.6975
» -4 Nitro »	$(C_6H_4NO_2COO)_2Sr.8H_2O$	1.340
» -4 Oxy »	$(C_6H_4OHCOO)_2Sr.H_2O$	11.098

STRONTIUM BROMIDE $SrBr_2.6H_2O$.

FREEZING-POINTS OF AQUEOUS SOLUTIONS OF STRONTIUM BROMIDE. (Milikan, 1917.)

t°.	Gms. $SrBr_2$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $SrBr_2$ per 100 gms. sat. sol.	Solid Phase.
— 1.7.....	6.9	Ice	—19.0.....	34.8	Ice
— 4.2.....	13.9	»	—28.0 (eutec.).	41.7	» +$SrBr_2.6H_2O$
— 8.4.....	23.2	»	0.....	46.8 (Kremers)	$SrBr_2.6H_2O$
—13.5.....	29.8	»			

SOLUBILITY OF STRONTIUM BROMIDE IN AQUEOUS SOLUTIONS OF STRONTIUM OXIDE AT 25° AND VICE VERSA. (Millikan, 1917.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
$SrBr_2$.	SrO.	Solid Phase.	$SrBr_2$.	SrO.	Solid Phase.
49.79	0.0	$SrBr_2.6H_2O$	40.66	0.84	$SrBr_2.SrO.9H_2O$+$SrO.9H_2O$
49.78	0.21	»+$SrBr_2.SrO.9H_2O$	38.68	0.79	$SrO.9H_2O$
48.06	0.25	$SrBr_2.SrO.9H_2O$	35.83	0.73	»
47.65	0.28	»	27.33	0.66	»
44.24	0.47	»	21.46	0.65	»
42.76	0.61	»	16.27	0.66	»
41.78	0.64	»	0.0	0.85	»

STRONTIUM CARBONATE $SrCO_3$.

SOLUBILITY OF STRONTIUM CARBONATE IN WATER SATURATED WITH CARBON DIOXIDE AT PRESSURE OF ONE ATMOSPHERE AND OF THIRTY-FIVE ATMOSPHERES AT 18°. (Haehnel, 1924.) (See Barium Carbonate, p. 1076.)

Pressure of Carbon Dioxide.	Gms. per 100 gms. sat. sol. Carbonate.	Bicarbonate.
1.0 atmosphere.....	0.12	0.17
35.0 atmosphere.....	0.38	0.57

The limit of solubility at 18° was at 25 atmospheres pressure of CO_2.

STRONTIUM PERCHLORATE $Sr(ClO_4)_2$.

SOLUBILITY OF ANHYDROUS STRONTIUM PERCHLORATE IN SEVERAL SOLVENTS AT 25°. (Willard and Smith, 1923.)

Solvent.	d_4^{25} of solvent.	d_4^{25} of sat. sol.	Gms. $Sr(ClO_4)_2$ per 100 gms. sat. sol.	Gms. $Sr(ClO_4)_2$ per 100 gms. solvent.
Water.....	—	2.0837	75.59	309.67
Methyl alcohol.....	0.78705	1.6771	67.95	212.01
Ethyl alcohol.....	0.78517	1.5539	64.37	180.66
n Propyl alcohol.....	0.7989	1.4266	58.40	140.38
n Butyl alcohol.....	0.8059	1.3394	53.16	113.49
iso » »	0.7981	1.2022	43.78	77.87
Acetone.....	0.7852	1.4984	60.01	150.06
Ethyl acetate.....	0.89457	1.4717	52.10	136.93

Strontium perchlorate crystallized from water at about 0° apparantly contained 4 H_2O. At about 25° a dihydrate, 2 H_2O, was obtained. Above 40° the crystals corresponded to the formula 3 $Sr(ClO_4)_2.2H_2O$. The transition point between this compound and the dihydrate was at about 37°. Evidence was also obtained of the possible existence of a monohydrate.

STRONTIUM CHLORIDE $SrCl_2.6H_2O$.

FREEZING-POINTS OF DILUTTE SOLUTIONS OF STRONTIUM CHLORIDE. (Klein and Svanberg, 1920.)

t° of f. pt.	—0.183.	—1.233.	—2.584.
Normality of aq. $SrCl_2$ solution	0.10	0.25	0.50

Solubility of Strontium Chloride in Aqueous Solutions of Hydrochloric Acid at 25°. (Milikan, 1918.)

Gms. per 100 gms. sat. sol. $SrCl_2$	Gms. per 100 gms. sat. sol. HCl	Solid Phase.	Gms. per 100 gms. sat. sol. $SrCl_2$	Gms. per 100 gms. sat. sol. HCl	Solid Phase.
35.60	0.0	$SrCl_2.6H_2O$	6.68	18.89	$SrCl_2.6H_2O$
33.97	0.66	»	2.11	27.14	» + $SrCl_2.2H_2O$
27.55	4.57	»	1.29	28.23	$SrCl_2.2H_2O$
9.86	16.12	»	0.13	37.66	»

Equilibrium in the System Strontium Oxide, Hydrochloric Acid and Water at 25°. (Milikan, 1918.)

Gms. per 100 gms. sat. sol. SrO.	Gms. per 100 gms. sat. sol. HCl.	Solid Phase.	Gms. per 100 gms. sat. sol. SrO.	Gms. per 100 gms. sat. sol. HCl.	Solid Phase.
0.08	37.72	$SrCl_2.2H_2O$	23.27	16.38	$SrCl_2.6H_2O$
0.10	36.59	»	23.83	16.19	» + $SrCl_2.SrO.9H_2O$
0.84	28.82	»	24.15	16.40	» »
1.38	28.16	» + $SrCl_2.6H_2O$	22.88	15.33	$SrO.9H_2O$ + »
1.46	28.10	$SrCl_2.6H_2O$	23.06	15.46	» »
4.37	21.96	»	22.94	15.37	» »
6.44	20.66	»	15.19	10.16	$SrO.9H_2O$
18.01	17.24	»	9.04	5.76	»
22.20	16.29	»	0.85	0.0	»

Equilibrium in the System Strontium Chloride, Strontium Oxide and Water. (Milikan, 1917.)

Gms. per 100 gms. sat. sol. $SrCl_2$.	Gms. per 100 gms. sat. sol. SrO.	Solid Phase.	Gms. per 100 gms. sat. sol. $SrCl_2$.	Gms. per 100 gms. sat. sol. SrO.	Solid Phase.
Results at 0°.			Results at 40°.		
30.68	0.0	$SrCl_2.6H_2O$	39.62	0.0	$SrCl_2.6H_2O$
30.55	0.31	» + $SrO.9H_2O$	39.26	1.36	» + 1.1.9
29.03	0.30	$SrO.9H_2O$	36.62	1.73	1.1.9
23.74	0.29	»	36.08	1.76	»
0.0	0.35	»	34.13	2.03	»
Results at 25°.			32.97	2.10	»
			32.07	2.47	» + $SrO.9H_2O$
35.60	0.0	$SrCl_2.6H_2O$	29.01	1.91	$SrO.9H_2O$
35.65	0.85	» + 1.1.9	28.84	1.90	»
33.41	1.09	1.1.9 + $SrO.9H_2O$	18.48	1.42	»
22.09	0.75	$SrO.9H_2O$	0.0	1.48	»
12.52	0.86	»	1.1.9 = $SrCl_2.SrO.9H_2O$.		
0.0	0.85	»			

100 gms. sat. solution of strontium chloride in selenium oxychloride ($SeOCl_2$) contain 5.17 gms. $SrCl_2$ at 25°. (Wise, 1923.)

STRONTIUM CINNAMATE $C_{18}H_{14}O_4Sr.4H_2O$.

100 cc. sat. solution of strontium cinnamate in water contain 1.4 gms. $C_{18}H_{14}O_4Sr$ at 20°. (Ephraim and Pfister, 1925.)

STRONTIUM CITRATE $Sr(C_6H_5O_7)_2.6H_2O$ and $Sr(C_6H_5O_7)_2.H_2O$.

Solubility of Each Hydrate Separately, in Water. (Chatterjee and Dhar, 1924.)

t°.	Gms. $Sr(C_6H_5O_7)_2$ per liter of Aq. solution sat. with $Sr(C_6H_5O_7)_2.6H_2O$.	Gms. $Sr(C_6H_5O_7)_2$ per liter of Aq. solution sat. with $Sr(C_6H_5O_7)_2.H_2O$.
30	1.26	2.97
95	1.57	1.54

STRONTIUM Silico **FLUORIDE** $SrSiF_6$.

100 gms. of a sat. solution of strontium silico fluoride in a solvent composed of 135 cc. H_2O + 9.0 cc. of 1.0 *n* HCl + 1.5 gm. $(NH_4)_2SiF_6$ + 48 cc. C_2H_5OH contain 1.061 gm. $SrSiF_6$ at 18°.5. (Leo, 1923.)

STRONTIUM FUMARATE $SrC_4H_2O_4$.

100 gms. H_2O dissolve 0.29 gm. $SrC_4H_2O_4$ at 30°. (Weiss and Downs, 1923.)

STRONTIUM HELIANTHATE $(C_{14}H_{14}N_3SO_3)_2Sr.4H_2O$.

1000 cc. H_2O dissolve 0.126 gm. $(C_{14}H_{14}N_3SO_3)_2Sr.4H_2O$ at 20-25°. (Stark and Dehn, 1918.)

STRONTIUM HYDROXIDE $Sr(OH)_2.8H_2O$.

SOLUBILITY OF STRONTIUM HYDROXIDE IN AQUEOUS SOLUTIONS OF STRONTIUM SULFHYDRATE AND VICE VERSA. (Terres and Brückner, 1920.)

Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
$Sr(OH)_2$.	$Sr(SH)_2$.	$Sr(OH)_2$.	$Sr(SH)_2$.	$Sr(OH)_2$.	$Sr(SH)_2$.	$Sr(OH)_2$.	$Sr(SH)_2$.
Results at 0°.		0.62	15.8	0.80	26.20	Results at 80°.	
0.41	0.00	0.60	18.3	0.42	28.30	7.78	0.00
0.30	1.56	0.55	20.3	0.30	29.25	5.60	5.60
0.25	6.68	1.00	24.0	0.10	31.60	5.00	9.50
0.22	12.65	0.25	26.0	0.00	31.60	4.88	15.50
0.20	14.80	0.20	26.8	Results at 60°.		4.10	19.60
0.16	18.20	0.15	27.5	3.63	0.00	2.70	27.50
0.15	19.05	0.00	29.7	3.15	1.60	2.10	28.00
0.10	23.40	Results at 40°.		3.04	6.08	1.40	30.40
0.10	24.80	1.75	0.00	3.16	11.85	0.05	35.60
0.20	27.5	1.65	1.40	3.15	16.72	0.00	35.60
0.00	27.50	1.60	4.87	1.75	25.0	Results at 100°.	
Results at 20°.		1.60	10.83	1.75	26.6	23.20	0.00
0.82	0.0	1.55	15.93	0.60	30.8	14.00	7.40
0.72	5.9	1.50	20.00	0.10	33.6	0.15	37.80
0.70	11.4	1.10	24.10	0.00	33.2	0.00	37.80

These results when plotted give curves composed of two branches corresponding respectively to the solid phases $Sr(OH)_2.8H_2O$ and $Sr(SH)_2.4H_2O$.

SOLUBILITY OF STRONTIUM HYDROXIDE IN AQUEOUS SOLUTIONS OF CANE SUGAR. (Sidersky, 1921.)

The mixtures were agitated from time to time during 24 hours. The dissolved strontium hydroxide was determined by titration with 1.0 *n* HCl, and the sugar by polarization. The determinations were plotted and the following table constructed from the curves.

Wt. per cent of Sugar in solution.	Gms. SrO per 100 gms. sat. sol. at				Gms. $Sr(OH)_2.8H_2O$ per 100 gms. sat. sol. a			
	3°.	15°.	24°.	40°.	3°.	15°.	24°.	40°.
0.0...	0.39	0.57	0.80	1.48	0.98	1.46	2.05	3.80
1.0...	0.45	0.65	0.90	1.68	1.15	1.67	2.30	4.31
5.0...	0.79	1.03	1.40	2.51	2.03	2.64	3.58	6.47
10.0...	1.21	1.48	2.03	3.55	3.10	3.79	5.20	9.10
15.0...	1.64	1.94	2.66	4.58	4.21	4.97	6.81	11.75
18.0...	1.90	2.21	3.05	5.20	4.89	5.67	7.78	13.33
20.0...	2.08	2.39	3.30	–	5.33	6.13	8.45	–
25.0...	2.51	2.85	3.90	–	6.44	7.31	10.00	–

STRONTIUM IODIDE $SrI_2.6H_2O$.

EQUILIBRIUM IN THE SYSTEM STRONTIUM IODIDE, STRONTIUM OXIDE AND WATER AT 25°. (Milikan, 1917.)

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
SrI_2.	SrO.	Solid Phase.	SrI_2.	SrO.	Solid Phase.
64.70	0.0	$SrI_2.6H_2O$	53.04	0.72	$SrI_2.2SrO.9H_2O$
64.04	0.16	«+$SrI_2.2SrO.9H_2O$	49.37	0.74	»+$SrO.9H_2O$
60.77	0.18	$SrI_2.2SrO.9H_2O$	39.50	0.55	$SrO.9H_2O$
55.58	0.46	»	29.98	0.53	»
55.09	0.51	»	22.36	0.57	»
54.16	0.60	»	0.0	0.85	»

STRONTIUM MALATE Active, $C_4H_4O_5Sr.4H_2O$; Racemic, $C_8H_8O_{10}Sr_2.5H_2O$.

Solubility of Active and of Racemic Strontium Malate, Each Separately, in Water. (Duboux and Cuttat, 1921.)

Saturation was secured by continuous rotation in a thermostat for 7 to 10 hours. The strontium was determined as carbonate and as sulfate.

Results for the Active Salt.

t°.	Gms. $C_4H_4O_5Sr$ per 100 gms. sat. sol.	Solid Phase.
0.0...	0.193	$C_4H_4O_5Sr.4H_2O$
12.5...	0.332	»
25.0...	0.490	»
37.5...	0.781	»

Results for the Racemic Salt.

t°.	Gms. $C_8H_8O_{10}Sr_2$ per 100 gms. sat. sol.	Solid Phase.
0.0...	0.290	$C_8H_8O_{10}Sr_2.5H_2O$
12.5...	0.325	»
25.0...	0.422	»
37.5...	0.550	»

Solubility of Strontium Malate in Aqueous Solutions of Strontium Chloride at 25°. (Walker, 1925.)

Constant agitation in a thermostat was employed for obtaining saturation. The results are expressed in terms of gram molecules of the saturating salt per 1000 gms. H_2O « corresponding to the weight molar concentration of the added salt ».

Gram. mols. per 1000 gms. H_2O		Gram. mols. per 1000 gms. H_2O	
Sr. malate.	$SrCl_2$.	Sr. malate.	$SrCl_2$.
0.03050	0.0000	0.02349	0.03103
0.02523	0.01828	0.02019	0.06149

STRONTIUM NITRATE $Sr(NO_3)_2$.

100 cc. Pyridine dissolve 0.64 gm. $Sr(NO_3)_2$ at 0° and 0.7 gm. at 25°. (Müller R., 1924.)

STRONTIUM PHENOLATE $(C_6H_5O)_2Sr.4H_2O$.

Equilibrium in the System Strontium Hydroxide, Phenol and Water at 25°. (Van Meurs, 1916.)

Mols. per 100 mols. sat. sol. $Sr(OH)_2$.	C_6H_5OH.	Solid Phase.	Mols. per 100 mols. sat. sol. $Sr(OH)_2$.	C_6H_5OH.	Solid Phase.
0.30	0.0	$Sr(OH)_2.8H_2O$	6.82	9.67	$(C_6H_5O)_2Sr.4H_2O$
0.72	0.49	»	8.87	20.24	»
1.48	1.28	»	9.38	24.84	»
3.83	3.74	»	11.16	47.30	»
4.86	4.80	»	9.62	63.77	»+C_6H_5OH
5.58	5.52	»	6.17	65.46	C_6H_5OH
6.12	6.04	»+$(C_6H_5O)_2Sr.4H_2O$	3.54	69.91	»

At concentrations of $Sr(OH)_2$ less than 0.5 mol. per cent two liquid layers are formed. Analyses of these gave the following results.

Aqueous layer.		Phenol layer.	
Mol. % $\frac{Sr(OH)_2}{2}$.	Mol. % C_6H_5OH.	Mol. % $\frac{Sr(OH)_2}{2}$.	Mol. % C_6H_5OH.
0.12	2.05	0.31	24.41
0.17	2.37	0.43	21.12
0.22	2.72	0.50	18.72
0 34	4.50	0.55	12.95

STRONTIUM Glycero PHOSPHATES.

Solubility of Each Separately in Water. (Bailly, 1916; Bailly and Gaumé, 1924.)

Compound.	Formula.	t°.	Gms. anhy. cmpd. per 100 gms. sat. sol.
Strontium α glycerophosphate (cryst.)	$Sr(C_3H_5)(OH)_2.PO_4$	16....	1.73
» β » »	$Sr(C_3H_5)(OH)_2.PO_4.2H_2O$	17....	2.31
» neutral »	$SrC_2H_4(OH).PO_4.H_2O$	16....	1.28
» » »	»	55....	0.58

100 gms. H_2O dissolve 2.69 gms. anhydrous strontium neutral glycerophosphate at 18°. (H. Rogier, *These*, Paris, 1912.)

STRONTIUM Methyl, Ethyl, etc. PHOSPHATES.

SOLUBILITY OF EACH SEPARATELY IN WATER. (Bailly, 1919.)

Constant agitation was not employed for securing saturation. The solutions were analyzed by evaporating to dryness and weighing the residues.

Compound.	Formula.	t°.	Gms. hydrated cmpd. per 100 gms. sat. sol.
Strontium Methyl Phosphate	$SrCH_3PO_4.H_2O$	14	1.24
» » »	»	50	0.75
» » »	»	100	0.38
» » » (Acid Salt.)	$Sr[CH_3HPO_4]_2.H_2O$	17	27.15
» Ethyl »	$Sr.C_2H_5PO_4.2H_2O$	20	1.29
» Propyl »	$Sr.C_3H_7PO_4.2H_2O$	18.5	1.96
» Allyl »	$Sr.CH_2CH:CH_2PO_4.H_2O$	20	1.80
» Iso propyl »	$SrCH\langle^{CH_3}_{CH_3}PO_4.2H_2O$	20	0.40
» Iso butyl »	$SrCH_2.CH\langle^{CH_3}_{CH_3}PO_4.2H_2O$	18	0.89

STRONTIUM SUCCINATE $C_4H_4O_4Sr$.

SOLUBILITY OF STRONTIUM SUCCINATE IN AQUEOUS SOLUTIONS OF SODIUM SUCCINATE AT 25°. (Walker, 1925.)

Constant agitation in a thermostat was employed for obtaining saturation The results are expressed in terms of gram molecules of the saturating salt per 1000 gms. H_2O « corresponding to the weight molar concentration of the added salt ».

Gm. mols. per 1000 gms. H_2O.		Gm. mols. per 1000 gms. H_2O.	
$C_4H_4O_4Sr$.	$C_4H_4O_4Na_2$.	$C_4H_4O_4Sr$.	$C_4H_4O_4Na_2$.
0.02013	0.0000	0.01322	0.03751
0.01740	0.00938	0.01221	0.05582
0.01535	0.01875	0.01143	0.07457

STRONTIUM SULFATE $SrSO_4$.

SOLUBILITY OF STRONTIUM SULFATE IN AQUEOUS SOLVENTS AT 19°.
(Kolthoff and Vogelenzang, 1919.)

Solvent.	Gms. $SrSO_4$ per liter.
Aq. 25 % Ethyl alcohol	0.019
» 50 % » »	0.000
» 50 % » » — 0.1 *n* HCl	0.120
» 50 % » » + 0.1 *n* NH_4Cl	0.040

STRONTIUM SULFONATES

SOLUBILITY OF EACH SEPARATELY IN WATER.
(Ephraim and Pfister, 1925 *a*.)

Compound.	Formula.	t°.	Gms. anhydrous cmpd. per 100 cc. sat. sol.
Strontium Benzene sulfonate	$Sr(C_6H_5SO_3)_2.H_2O$	20	15.493
» Anthracene-1- »	$Sr(C_{14}H_9SO_3)_2.3H_2O$	20	0.1157
» Naphthalene-2- »	$Sr(C_{10}H_7SO_3)_2.H_2O$	16.5	0.88
» » -5-Chlor-1- »	$Sr(C_{10}H_6SO_3Cl)_2.3H_2O$	20	0.551
» » -6-Oxy-2- »	$Sr(C_{10}H_7SO_3)_2.6H_2O$	20	1.111
» 2,6,8, Naphthylamine disulfonate	$Sr.C_{10}H_7.NH_2.SO_3)_2.2H_2O$	15	20.80*
» 2,5,7 » »	»	15	29.48*

* Gms. anhydrous salt. per 100 gms. of saturated solution.

STRONTIUM THIOSULFATE $SrS_2O_3.5H_2O$.

100 gms. of a saturated solution of strontium thiosulfate in a solvent composed equal volumes of water and acetone contain 0.35 gm. SrS_2O_3 at 18°.5. (Leo, 1923.)

STRONTIUM TARTRATE Active, $C_4H_4O_6Sr.4H_2O$; Racemic, $C_8H_8O_{12}Sr_2.8H_2O$.

Solubility of Active and of Racemic Strontium Tartrate, Each Separately, in Water. (Deboux and Cuttat, 1921.)

Saturation was secured by continuous agitation in a thermostat for 7 to 10 hours. The strontium was determined as carbonate and as sulfate.

Results for the Active salt.			Results for the Racemic salt.		
t°.	Gms. $C_4H_4O_6Sr$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $C_4H_4O_6Sr$ per 100 gms. sat. sol.	Solid Phase.
0.0....	0.0942	$C_4H_4O_6Sr.4H_2O$	0.0....	0.0107	$C_8H_8O_{12}Sr_2.8H_2O$
12.5....	0.1285	»	12.5....	0.0202	»
25.0....	0.1765	»	25.0....	0.0297	»
37.5....	0.2395	»	37.5....	0.0392	»

STRONTIUM Di THIONATE $SrS_2O_6.4H_2O$.

100 gms. sat. solution of strontium dithionate in water contain 4.51 gms. SrS_2O_6 at 0°, 7.37 gms. at 10°, 10.8 gms. at 20° and 14.9 gms. at 30°. (de Baat, 1926.)

Solubility of Strontium Dithionate in Aqueous Ethyl Alcohol at 30°. (de Baat, 1926.)

Gms. per 100 gms. sat. sol.		Solid Phase.	Gms. per 100 gms. sat. sol.		Solid Phase.
SrS_2O_6.	C_2H_5OH.		SrS_2O_6.	C_2H_5OH	
14.90	0.0	$SrS_2O_6.4H_2O$	0.08	60.39	$SrS_2O_6.4H_2O$
5.40	14.48	»	0.0012	76.13	»
0.68	37.22	»	0.000	98.53	»

STRYCHNINE $C_{21}H_{22}N_2O_2$.

Solubility of Strychnine in Water. (Kolthoff, 1925.)

The dissociation constantes calculated from p_H values determined colorimetrically in mixtures of dilute standard solutions of strychnine nitrate and sodium hydroxide, were $K_1 = 10.10^{-7}$ and $K_2 = 2.2.10^{-12}$. For the determination of the solubility product 5 cc. of 0.025 molecular strychnine nitrate solution gave a faint trace of crystalline precipitate with 0.75 cc. of 0.01 *n* Na OH solution. The precipitated strychnine was, accordingly, in equilibrium with a 0.02 *n* strychnine nitrate solution which was found to have a p_H value of 6.5. This corresponds to a p_{OH} of 7.7 or a [OH] of 2.10^{-8} and the solubility product $L_{Strychnine} = 4.10^{-10}$. Calculating from K_1 and L the concentration of a saturated aqueous solution of strychnine is $4.2.10^{-4}$ mol. per liter at 15°. A direct determination of the solubility of strychnine in water, made by Mauz, gave $2.7.10^{-4}$ mol. strychnine per liter at 15°.

100 cc. of sat. sol. of Strychnine in pure acetone contain 0.132 gms. $C_{21}H_{22}N_2O_2$ at 15°
» » » in Ether of $d = 0.720$ » 0.034 » »
(Harvey and Back, 1921.

100 gms. *p* cymene dissolve 0.71 gm. strychnine at 30° and 0.95 gm. at. 100°. (Wheeler, 1920.)

STRYCHNINE HELIANTHATE $C_{14}H_{15}N_3SO_3.C_{21}H_{22}N_2O_2$.

1000 cc. H_2O dissolve 0.481 gm. strychnine helianthate at 20-25°. (Stark and Dehn, 1918.)

STRYCHNINE SULFONPROPIONATE *d* and *l* $C_3H_6O_5S.C_{21}H_{22}N_2O_2H_2O$.

Solubility of the Dextro and of the Laevo Salts, Separately, in Water at 24°.6. (Franchimont and Backer, 1920.)

	Compound.	Formula.	Gms. anhydrous compound per 100 gms. sat. sol.
d	Strychnine Sulfonpropionate..	$C_3H_6O_5S.C_{21}H_{22}N_2O_2.H_2O$	6.0
l	» »	»	27.7

STYPHNIC ACID (2.4.6 Trinitro Resorcinol) $C_6H(OH)_2(NO_2)_3$.

Solubility of Styphnic Acid in Aqueous Solutions of Hydrochloric Acid and of Nitric Acid at 25°. (Knox and Richards, 1919.)

In aq. Hydrochloric acid.

Equiv. Normality.		Equiv. Normality.	
HCl.	$C_6H(OH)_2(NO_2)_3$.	HCl.	$C_6H(OH)_2(NO_2)_3$.
0.00	0.02179	6.997	0.00163
1.410	0.00062	8.418	0.00197
2.814	0.00060	11.10	0.00397
4.221	0.00072	11.16	0.00387
5.634	0.00093		

In aq. Nitric acid.

Equiv. Normality.		Equiv. Normality	
HNO_3.	$C_6H(OH)_2(NO_2)_3$.	HNO_3.	$C_6H(OH)_2(NO_2)_3$.
0.00	0.02179	10.31	0.007944
1.785	0.001403	11.97	..01298
4.171	0.002180	13.97	0.02742
6.234	0.003274	15.57	0.03611
8.368	0.005108		

Freezing-point data for mixtures of styphnic acid and stilbene, styphnic acid and trinitrotoluene and for styphnic acid and trinitroxylene are given by Efremov, 1919 *a*.

SUBERIC ACID $C_6H_{12}(COOH)_2$.

Solubility of Suberic Acid in Aqueous Solutions of Acetic Acid, Hydrochloric Acid, Nitric Acid and Sulfuric Acid at 25°. (Knox and Richards, 1919.)

In aq. Acetic acid.

Equiv. Normality.	
CH_3COOH.	$C_6H_{12}(COOH)_2$.
0.0	0.0680
0.435	0.0776
0.887	0.0902
2.112	0.1340
4.262	0.2891
6.350	0.4317
8.402	0.5846

In aq. Hydrochloric acid.

Equiv. Normality.	
HCl.	$C_6H_{12}(COOH)_2$.
1.423	0.0498
2.858	0.0428
4.281	0.0412
5.691	0.0432
7.130	0.0504
8.378	0.0633
9.865	0.0905
11.20	0.1370

In aq. Sulfuric acid.

Equiv. Normality.	
H_2SO_4.	$C_6H_{12}(COOH)_2$.
0.000	0.068
1.858	0.039
5.233	0.037
7.524	0.042
11.33	0.060
18.65	0.200

In aq. Nitric acid.

Equiv. Normality.		Equiv. Normality.		Equiv. Normality.	
HNO_3.	$C_6H_{12}(COOH)_2$.	HNO_3.	$C_6H_{12}(COOH)_2$.	HNO_3.	$C_6H_{12}(COOH)_2$.
0.00	0.0680	1.543	0.0695	8.091	0.1575
0.307	0.0594	2.021	0.0839	10.05	0.2231
0.555	0.0590	4.035	0.0999	11.77	0.3896
0.906	0.0634	5.749	0.1133	13.30	0.6049

SUCCINAMIDE $(CH_2)_2(CONH_2)_2$.

100 cc. H_2O dissolve 1.836 gm. succinamide at 50°. (Viseur, 1926.)

SUCCINIC ACID $(CH_2)_2(COOH)_2$.

Solubility of Succinic Acid in Water and in Ethyl Ether. (Forbes and Coolidge, 1919.)

Solvent.	t°.	$d\frac{t°}{4}$ of sat. sol.	Gms. $(CH_2)_2(COOH)_2$ per 100 gms. sat. sol.
Water	15	1.012	5.09
	20	1.016	6.30
	25	1.021	7.67
Water sat. with ether	15	0.999	5.68
	20	1.005	7.10
	25	1.010	8.76
Ether	15	0.719	0.353
	20	0.714	0.420
	25	0.710	0.487
Ether sat. with water	15	0.730	1.289
	20	0.726	1.475
	25	0.722	1.689

SOLUBILITY OF SUCCINIC ACID IN AQUEOUS SOLUTIONS OF ACETIC ACID AND OF FORMIC ACID AT 25°. (Knox and Richards, 1919.)

In Aq. CH_3COOH.				In Aq. HCOOH.			
Equiv. Normality		Equiv. Normality		Equiv. Normality		Equiv. Normality	
CH_3COOH.	$(CH_2)_2(COOH)_2$.	CH_3COOH.	$(CH_2)_2(COOH)_2$.	HCOOH.	$(CH_2)_2(COOH)_2$.	HCOOH.	$(CH_2)_2(COOH)_2$.
0.000	1.352	6.655	1.639	0.090	1.369	11.29	1.228
0.078	1.384	8.661	1.519	0.446	1.397	15.29	0.944
0.448	1.415	10.340	1.357	0.930	1.408	17.67	0.796
0.916	1.452	12.400	1.097	3.730	1.501	19.16	0.715
2.828	1.592	14.640	0.797	5.547	1.531	20.53	0.667
4.536	1.643	16.850	0.514	7.500	1.449	22.93	0.604

SOLUBILITY OF SUCCINIC ACID IN AQUEOUS SOLUTIONS OF HYDROCHLORIC ACID, NITRIC ACID AND OF SULFURIC ACID AT 25°. (Knox and Richards, 1919.)

In Aq. Hydrochloric Acid.		In Aq. Nitric Acid.		In Aq. Sulfuric Acid.	
Equiv. Normality		Equiv. Normality		Equiv. Normality	
HCl.	$(CH_2)_2(COOH)_2$.	HNO_3.	$(CH_2)_2(COOH)_2$.	H_2SO_4.	$(CH_2)_2(COOH)_2$.
0.00	1.352	1.299	1.134	1.981	0.908
2.751	0.681	3.034	0.941	3.816	0.683
5.964	0.402	5.236	0.724	4.926	0.563
7.335	0.353	6.616	0.652	8.122	0.388
8.950	0.333	9.710	0.528	10.220	0.340
9.732	0.328	11.110	0.518	13.81	0.30
10.400	0.337	13.510	0.561	17.65	0.30
11.980	0.378	15.430	0.731	20.28	0.39
				23.18	0.69

SOLUBILITY OF SUCCINIC ACID IN AQUEOUS SOLUTIONS OF SALTS AT SEVERAL TEMPERATURES. (Linderstrom-Lang, 1924.)

Composition of Aq. Solvent.		Gm. mols. $(CH_2)_2(COOH)_2$ dissolved per liter at			Composition of Aq. Solvent.		Gm. mols. $(CH_2)_2(COOH)_2$ dissolved per liter at 17°.85.
Salt used.	Gm. equiv. per liter.	11°.85.	18°.0.	23°.75.	Salt used.	Gm. equiv. per liter.	
None....	$=H_2O$	0.3854	0.4974	0.6344	None....	$=H_2O$	0.4920
Li Cl ...	0.335	–	0.4417	–	Rb Cl...	0.6	0.4955
» ...	0.669	0.3062	0.3950	0.5037	» ...	1.2	0.4980
» ...	1.338	0.2435	0.3151	0.4046	» ...	2.4	0.4955
» ...	2.676	0.1558	0.2018	0.2590	Cs Cl ...	0.578	0.5085
» ...	4.013	0.1036	0.1348	0.1739	» ...	0.867	0.5169
Na Cl...	0.1	–	0.4889	–	» ...	1.733	0.5355
» ...	0.4	0.3584	0.4611	0.5853	K Br....	0.6	0.4938
» ...	0.8	0.3330	0.4262	0.5406	»	1.2	0.4899
» ...	1.6	0.2853	0.3602	0.4597	»	2.4	0.4777
» ...	2.4	–	0.3091	–	Na I....	0.6	0.4715
» ...	3.2	0.2082	0.2625	0.3305	»	1.2	0.4502
» ...	4.0	–	0.2246	–	»	2.4	0.4101
K Cl....	0.35	–	0.4913	–	Kl.....	0.6	0.5132
»	0.70	0.3824	0.4851	0.6112	»	1.2	0.5300
»	1.4	0.3771	0.4713	0.5909	»	2.4	0.5495
»	2.1	0.3693	0.4564	0.5708			
»	2.8	0.3593	0.4413	0.5459			
»	3.5	–	0.4262	–			

DISTRIBUTION OF SUCCINIC ACID BETWEEN WATER AND ETHYL ETHER.
(Forbes and Coolidge, 1919.)

Results at 15°. Gms. $(CH_2)_2(COOH)_2$ per 100 gms.		Results at 20°. Gms. $(CH_2)_2(COOH)_2$ per 100 gms.		Results at 25°. Gms. $(CH_2)_2(COOH)_2$ per 100 gms.	
H_2O layer.	$(C_2H_5)_2O$ layer.	H_2O layer.	$(C_2H_5)_2O$ layer.	H_2O layer.	$(C_2H_5)_2O$ layer.
2.285	0.5025	1.274	0.2525	2.273	0.410
2.689	0.592	2.655	0.528	4.38	0.804
3.475	0.773	3.03	0.605	6.44	1.208
5.22	1.182	3.82	0.768	8.76	1.214
5.68	1.289	5.57	1.137	—	1.689
		7.10	1.475		

Calculations of the undissociated acid in each layer are also given by the authors.

Results at 19°. (Schilow and Lepin, 1922.) Gms. $(CH_2)_2(COOH)_2$ per 100 cc.			Results at 25°. (Smith, 1921, 1922.) Millimols. $(CH_2)_2(COOH)_2$ per liter		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.975	0.133	0.1364	1.600	0.2880	0.180
1.910	0.266	0.1393	2.625	0.4875	0.186
3.940	0.554	0.1406	4.3625	0.8625	0.1975
8.160*	1.154*	0.1411	7.95	1.55	0.195
* Sat. with $(CH_2)_2(COOH)_2$.			13.80	2.75	0.199

Additional data upon the distribution of succinic acid between water and ether are given by Wosnessensky, 1923, and Perschke, 1926.

DISTRIBUTION OF SUCCINIC ACID BETWEEN :

Water and Amyl Ether at 19°. (Schilow and Lepin, 1922.) Gms. $(CH_2)_2(COOH)_2$ per liter of		Water and Chloroform at 25°. (Smith, 1921, 1922.) Millimols. $(CH_2)_2(COOH)_2$ per liter of			Acetone and Glycerol at 25°. (Smith, 1921, 1922.) Millimols. $(CH_2)_2(COOH)_2$ per liter of		
H_2O layer.	Amyl ether layer.	H_2O layer (C_1).	$CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.	Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
1.914	0.0355	13.50	0.15	0.0110	0.7625	1.35	0.565
2.675	0.0448	20.50	0.30	0.0146	1.325	1.9625	0.675
4.270	0.0541	34.90	0.60	0.0172	1.550	2.675	0.580
4.830	0.0564	48.00	0.95	0.0198	2.925	4.725	0.619
6.56	0.0708*	* Solid Phase present.			3.275	5.70	0.575

100 cc. sat. sol. of succinic acid in acetone contain 3.86 gms. $(CH_2)_2(CO\,OH)_2$ at 20°. (Viseur, 1926.)

100 gms. *p* cymene dissolve 0.02 gms. succinic acid at 25°. (Wheeler, 1920.)

Freezing-point data for mixtures of succinic acid and urea are given by Kremann, Weber and Zechner, 1925.

Brom SUCCINIC ACID $CHBrCH_2(COOH)_2$.

DISTRIBUTION OF BROM SUCCINIC ACID AT 25° BETWEEN : (Smith, 1921, 1922.)

Water and Ether. Millimols. $CHBrCH_2(COOH)_2$ per liter			Water and Glycerol. Millimols. $CHBrCH_2(COOH)_2$ per liter		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.	Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
0.63125	0.4500	0.712	1.625	1.281	1.27
1.3625	1.1625	0.853	2.375	1.725	1.34
2.00	1.925	0.963	5.575	3.925	1.42
3.50	3.85	1.10	11.575	7.675	1.51
6.70	8.90	1.35			

Water and Xylene.

Millimols. $CHBrCH_2(COOH)_2$ per liter of			
H_2O layer.....	25.90	61.70
Xylene layer.....	0.555	1.85

Solubility of Dichloro Succinic Acids in Water and Other Solvents at 25°.

(Holmberg, 1921.)

Compound.	Solvent.	Gms. cmpd. dissolved per liter of sat. sol.
Meso Dichloro Succinic acid (m. pt. 217–18°)	$CH_3COOH+C_6H_6$*	3.17
Acid salt of » » » with *i* Phenylethylamine	H_2O	81.4
» » » » » » *d* »	»	76.4
» » » » » » *l* »	»	76.1
Racemic » » » (m. pt. 174–5°)	$CH_3COOH+C_6H_6$	11.03
Acid salt of » » » with *i* Phenylethylamine	H_2O	18.67
Dextro » » » (m. pt. 166–7°)	$CH_3COOH+C_6H_6$	22.6
Acid salt of » » » with *d* Phenylethylamine	H_2O	21.8
» » » » » » *l* »	»	75.4
Laevo » » » (m. pt. 166–7°)	$CH_3COOH+C_6H_6$	22.5
Acid salt of » » » with *d* Phenylethylamine	H_2O	75.8
» » » » » » *l* »	»	21.8

* The mixture consisted of 10 volumes of CH_3COOH diluted to 100 volumes with C_6H_6.

Solubility of the Stereoisomeric Forms of β Xanthogen Succinamide Acid, $HO\,OC.CH\,(CS.OC_2H_5).CH_2\,CO\,NH_2$, in Water at 25°.

(Holmberg and Leander, 1917.)

Isomeric Form.	M. pt.	Gm. mols. per liter.	Gms. per liter.
Inactive.....	125°–126°	0.0219	5.20
Dextro.....	134°–135°	0.0190	4.50
Laevo.....	134°–135°	0.0190	4.50

SUCCINIMIDE $\begin{matrix}CH_2CO\\CH_2CO\end{matrix}>NH.H_2O$.

Solubility of Succinimide Hydrate in Water and in Ethyl Alcohol.

(Speyers, 1902; see Note p. 1001.)

In Water.				In Ethyl Alcohol.			
t°.	Wt. of 1 cc. of sat. sol.	Mols. per 100 mols. sol.	Gms. per 100 gms. H_2O.	t°.	Wt. of 1 cc. of sat. sol.	Mols per 100 mols. sol.	Gms. per 100 gms. C_2H_5OH.
0...	1.025	1.58	10.4	0...	0.815	0.88	2.26
10...	1.035	2.4	17.5	10...	0.809	1.35	3.4
20...	1.052	4.0	30.0	20...	0.806	2.0	5.2
25...	1.067	5.9	44.0	25...	0.805	2.5	6.6
30...	1.086	8.0	60.0	30...	0.804	3.1	8.4
40...	1.120	12.8	95.0	40...	0.809	4.9	13.4
50...	1.145	17.8	135.0	50...	0.816	7.8	21.0
60...	1.167	22.6	185.0	60...	0.835	12.3	36.0
70...	1.189	27.5	245.0	70...	0.873	–	–

SUGAR (Sucrose) $C_{12}H_{22}O_{11}$ (Cane Sugar).

Freezing-Points of Aqueous Solutions of Cane Sugar.

(Kremann and Eitel, 1923.)

t° of f. pt.	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. sat. sol.	t° of f. pt.	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. sat. sol.	t° of t. pt.	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. sat. sol.
−0.58, −0.61	9.234	−5.70, −5.75	43.77	(−10.42,	56.52)
−1.51, 1.57	19.472	6.03, 6.64	44.73	−11.95, −12.21	58.37
−2.31, −2.35	25.98	−7.39, 7.46	48.52	(−12.46	60.00)
−3.03, −3.15	31.75	7.78, 7.84	50.00	(−13.68	62.12
(−4.03,	37.51)	8.34, −8.58	51.48	−14.43, −14.51	62.58
−4.25,	37.75	10.27, −10.34	54.88	(−13.9 Eutec.	62.40)
				(−17.0	66.67)

The results in parentheses are by Mondain-Monval, 1925.

The eutectic as given by Kremann and Eitel is at — 14°.5 and 62.5 % $C_{12}H_{22}O_{11}$.

Solubility of Cane Sugar in Water. (Mondain-Monval, 1925.)

The solutions were saturated by two periods of 24 hours constant rotation in a thermostat. The saturated solutions were analyzed polarimetrically. Equilibrium was reached more quickly from below than from above.

t°	0.9.	15.8.	25.6.	30.5.
Gms. $C_{12}H_{22}O_{11}$ per 100 gms. H_2O	180.5	196.0	210.5	218.0

The following determinations of the density of saturated aqueous solutions of cane sugar are given by Horiba, 1917.

t°	*d* of sat. sol.	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. sat. sol.	t°	*d* of sat. sol.	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. sat. sol.
0.....	1.321	64.18	40.....	1.339	70.42
10.....	1.325	65.58	50.....	1.344	72.25
20.....	1.329	67.09	60.....	1.350	74.18
30.....	1.334	68.70			

Solubility of Sucrose in Aqueous Solutions of Invert Sugar.

(Van der Linden, 1919.)

Results at 30°. Gms. per 100 gms. H_2O		Gms. per 100 gms. H_2O.		Results at 50°. Gms. per 100 gms. H_2O	
Sucrose.	Invert Sugar.	Sucrose.	Invert Sugar.	Sucrose.	Invert Sugar.
219.0	0.0	180.7	121.8	260.4	0.0
214.8	5.5	169.8	156.0	253.6	55.0
211.9	10.5	164.0	189.1	242.1	76.5
204.4	26.2	150.3	268.6	230.1	144.5
200.2	56.1	136.3	309.0	228.2	199.9
182.9	103.2	127.1	401.4	213.9	261.5
				202.5	314.8
				200.6	316.7

Solubility of Cane Sugar in Pure Hydrogen Peroxide.

(Maass and Hatcher, 1922.)

The temperatures were determined at which the last crystal of solid dissapeared in accurately weighed mixtures of the constituents.

t°	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. sat. sol.	t°	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. sat. sol.
—1.97.....	3.88	— 5.70.....	30.94
—2.60.....	11.64	— 7.57.....	36.82
—3.47.....	18.66	—10.30.....	42.86
—4.72.....	25.16	—14.32.....	50.00

Solubility of α and β Lactose (Milk Sugar) in Water. (Gillis, 1920.)

The determinations were made to supplement those of Hudson, 1908. Accurately weighed amounts of the sugar and water were sealed in tubes, and, while being slowly agitated, the temperature was determined at which the last crystal just dissapeared.

The column headings for mol. % and wt. % as given in the original table for α lactose are the reverse of those here shown.

The author gives an exhaustive treatment of the equilibria between the two anhydrous modifications of lactose and considers the system water-milk sugar to be a pseudo ternary system with a transi-dehydration temperature of 93.5°.

Results Obtained with α Lactose.

t°	Mol. % $C_{12}H_{22}O_{11}$ in sat. sol.	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. sat. sol.
128.4....	11.77	71.8
128.0....	12.06	72.3
134.0....	13.06	74.0
146.2....	16.14	78.3
158.1....	19.08	81.7
164.1....	21.46	83.8

Results Obtained with β Latose.

t°	Mol. % $C_{12}H_{22}O_{11}$ in sat. sol.	Gms. $C_{12}H_{22}O_{11}$ per 100 gms. sat. sol.
88.6....	6.34	58.25
107.0....	8.54	63.94
121.5....	10.67	69.41
133.6....	12.58	73.22
138.8....	13.76	75.20
158.8....	18.50	81.13
178.8....	25.58	86.72
200.0....	39.41	92.51

Solubility of Hydrated Lactose in Water. (Saillard, 1919.)

The hydrated lactose which was used contained a trace of mineral matter and less than 0.10 % hygroscopic H_2O as determined by drying at 105°. Constant agitation was employed for obtaining saturation and equilibrium was approached from below and from above. In the latter case the mixture was previously heated to 75°-80°. A trace of formol was added in both cases, before the period of agitation.

t°	21.5	28.0	38.0	48.0	57.0	65.0
Gms. $C_{12}H_{22}O_{11}$ per 100 gms. H_2O ..	20.0	24.0	30.7	42.1	56.0	77.0

Note. — It is pointed out by Gillis, 1920, that the above determinations at 48°, 57° and 65°, and the result of Hudson at 89°, are undoubtedly incorrect. Very carefully made new determinations between 50° and 100°, have confirmed the transi-dehydration temperature of 93°.5 for α and β lactose.

Solubility of Lactose in Mixtures of Water and Pyridine. (Pucher and Dehn, 1921.)

Per cent C_5H_5N in solvent.	Gms. Lactose per 100 gms. solvent at 1°	Gms. Lactose per 100 gms. solvent at 25°	Per cent C_5H_5N in solvent.	Gms Lactose per 100 gms. solvent at 1°.	Gms Lactose per 100 gms. solvent at 25°.
0.0	19.18	23.04	70.0	2.85	3.22
10.0	17.84	22.35	80.0	1.62	2.62
20.0	15.29	19.24	81.4	2.22	2.50
30.0	12.93	15.48	90.0	1.75	1.77
40.0	9.48	10.56	91.0	1.83	1.82
50.0	6.87	7.75	100.0	1.61	2.22
60.0	4.61	5.62			

100 gms. Abs. Alcohol dissolve 0.09 gm. Lactose at 20-25°. (Pucher and Dehn, 1921.)
» Quinoline » 1.96 » » »
» Equi. mol. mixture of alcohol and quinoline dissolve 1.32 gm. Lactose at 20-25°.

SULFANILIC ACID $p\,NH_2.C_6H_4SO_3H.H_2O$.

Solubility of Sulfanilic Acid in Water. (Philip and Colborne, 1924.)

t°.	Gms. $NH_2.C_6H_4SO_3H$ per 100 gms. sat. sol.	Solid Phase.
69.9	3.74	$NH_2.C_6H_4SO_3.H$
85.0	4.74	»

Data for the solubility of trimethyl sulfanilic acid in water and in aqueous solutions of acetic and hydrochloric acids are given by Katayama and Yamada, 1920.

SULFONAL $(CH_3)_2C(SO_2C_2H_5)_2$.

Solubility of Sulfonal in Several Solvents. (Falck, 1919.)

Constant agitation was employed and equilibrium was approached from above and below. The aqueous saturated solutions were analyzed by extracting with chloroform, evaporating and weighing the residue.

Solvent.	t°.	Gms. $(CH_3)_2C(SO_2C_2H_5)_2$ per 100 gms. sat. sol.	Solvent.	t°.	Gms. $(CH_3)_2C(SO_2C_2H_5)_2$ per 100 gms. sat. sol.
Water	18.	0.236	Chloroform	20.	23.26
»	37.	0.448	Methylene chloride (CH_2Cl_2).	20.	26.13
»	100.	11.11	Benzene	17.	7.32
Aq. 2 % NaCl.	18.	0.231	Ethyl Acetate	20.	6.77
Aq. 90 % Alcohol.	16.	1.642	Toluene	20.	4.93
Ether	15.	1.25	Carbon Tetrachloride	20.	0.90
»	17.	1.33	Carbon Disulfide	20.	0.226
»	19.	1.47	Aq. Urethan*	17.	1.57

*Composed of 1 part Urethan + 1 1/2 parts Water, $d = 1.0455$.

10 cc. of horse serum dissolve 0.015 gm. sulfonal at 20°. The distribution between horse serum in contact with olive oil was 0.0123 gm. sulfonal per 10 cc. of serum layer and 0.0027 gm. per 10 cc. of olive oil layer. (Aiello, 1921.)

SULFUR S

Solubility of Sulfur in Aqueous Solutions of Alkalies at the Ordinary Temperature. (Calcagni, 1920.)

Solvent.	Gms. S per 100 cc. of sat. solution.	Solvent.	Gms. S per 100 cc. of sat. solution.
Aq. Ammonia ($d = 0.888$)	1.367	Aq. saturated $Mg(OH)_2$	0.014
Aq. 66 % K OH	17.70	» $Ca(OH)_2$	0.112
» Na OH	24.55	» $Ba(OH)_2$	2.60

No difference was found between solutions which had been kept in the dark and in the light.

Solubility of Sulfur in Benzene, in Benzine and in Bromoform.

Solvent.	t°.	Gms. S per 100 gms. sat. solution.	Autority.
Benzene	25	2.074	Hildebrand and Jenks, 1921.
»	54	5.165	»
»	84	13.02	»
Benzine	15	1.56	Delaplace, 1922.
»	20	1.96	»
Bromoform	5.6	3.64	Amadori, 1922.

Solubility of Sulfur in Carbon Tetrachloride.
(Hildebrand and Jenks, 1921; Delaplace, 1922; Jacek, 1926.)

t°.	Gms. S per 100 gms. sat. sol.	t°.	Gms. S per 100 gms. sat. sol.	t°.	Gms. S per 100 gms. sat. sol.
—24.0	0.148 (J.)	0.0	0.339 (H. and J.)	25	0.831 (H. and J.)
—20.75	0.185 »	15.5	0.641 (D.)	35	1.155 »
—11.25	0.255 »	18	0.720 »	45	1.564 »
— 9.0	0.277 »	22	0.748 »	54	2.008 »
0.0	0.366 »	23.25	0.841 (J.)		

Solubility of Sulfur in Carbon Disulfide.
(Jacek, 1915.)

Saturation was secured by constant agitation and all necessary precautions were taken for accurate work.

t°.	Gms. S per 100 gms. CS_2.	t°.	Gms. S per 100 gms. CS_2.	t°.	Gms. S per 100 gms. CS_2.
—109.5	1.05	—65	3.674	—36.5	7.950
— 86.0	2.24	— 59	4.387	—25.0	10.960
— 81.5	2.443	—47	5.889	—17.0	13.96
— 74.0	2.89	—44	6.440	—13.0	15.28
				— 0.0	23.13

Solubility of Sulfur in Chloroform in Ethyl Ether and in Ethylene Chloride.

In Chloroform. (Delaplace, 1922.)		In Ethyl Ether (anhy.). (Delaplace, 1922.)		In Ethylene Chloride. (Hildebrand and Jenks, 1921.)	
t°.	Gms. S per 100 gms. sat. sol.	t°.	Gms. S per 100 gms. sat. sol.	t°.	Gms. S per 100 gms. sat. sol.
13	0.790	13	0.187	25	0.826
15	0.868	23	0.283	40	1.380
24	1.216			79	5.43
				97.5	9.97

Solubility of Sulfur in Heptane.
(Hildebrand and Jenks, 1921.)

t°.	0.	25.	35.	45.	54.
Gms. S per 100 gms. sat. sol.	0.124	0.362	0.512	0.698	0.926

Solubility of Sulfur in Rail Road Light Oil.
(Thompson and Odeen, 1920.)

t°.	0.	24.	28.
Gms. per 100 cc. sat. sol.	0.198	0.324	0.364

Solubility of Sulfur in the Persulfides of Hydrogen.
(Walton and Whitford, 1923.)

The mixtures were constantly stirred in a quartz tube with a quartz stirrer and the solution analyzed repeatedly untill equilibrium had been reached. The analysis was made by adding acetone to decompose the persulfide. The solvents were then allowed to evaporate spontaneously and the residue of rhombic sulfur dried at 90° to constant weight as « sulfur not evolved as hydrogen sulfide ». The existence of a compound having the composition H_2S_6, and stable below — 1°.45 was established. Hydrogen disulfide (H_2S_2) and hydrogen trisulfide (H_2S_3) dissolve sulfur copiously. When these two liquids are saturated with sulfur at a given temperature the two resulting liquid phases have the same composition. The following results were obtained for the solubility of sulfur in the trisulfide of hydrogen.

t°.	Per cent S in sat. sol. not evolved as H_2S.	t°.	Per cent S in sat. sol. not evolved as H_2S.	t°.	Per cent S in sat. sol. not evolved as H_2S.
—34.72....	53.56	— 1.45....	82.50	35.4....	89.46
—15.42....	71.18	— 0.05....	82.97	45.15....	91.00
—10.6.....	75.16	17.92	86.77	55.3.....	92.49
— 3.75....	80.71	25.4.....	87.98		

Solubility of Sulfur in Pyridine. (Hammick and Holt, 1926.)

The temperature of weighed mixtures of the constituents, contained in sealed tubes, was raised or lowered untill the point was reached at which the sulfur phase increased or diminished. The observations of the end point were accurate to 0.3-0°.5.

Solid-Liquid Equilibria.

t°.	Wt. % S.	Solid Phase.
84.5...	10.5	Rhombic S
91.5...	13.35	»
95.2...	15.9	»
97.5...	16.9	»
101.....	19.2	Monoclinic S
110.....	98.0	»

Liquid–Liquid Equilibria.

t°.	Wt. % S.	t°.	Wt. % S.
About 80..	13.35	160.5...	59.0
98.0...	19.2	161.0...	70.0
116.0...	24.65	156.0...	79.7
127.5...	29.8	147.0...	87.78
144.0...	38.8	132.5...	88.4
157.0...	50.7	137.0...	90.0
		127.0...	91.94

Solubility of Sulfur in Quinoline. (Hammick and Holt, 1926.)

The determinations were made as described above.

Solid–Liquid Equilibria.

Rhombic Sulfur.		Monoclinic Sulfur.	
t°.	Wt. % S.	t°.	Wt. % S.
74.5...	13.8	88.75...	24.0
85.8...	19.8	91.0....	25.9
93.2...	25.9	96.0....	32.8
93.8...	27.35	97.1....	35.8
94.2...	28.7	98.5....	39.0
94.6...	30.4	99.2....	41.9
96.5...	32.8	100.9....	45.4
96.0...	32.95	101.1....	49.5
98.5...	41.9	101.4....	57.0
99.5...	49.5	101.8....	66.75
99.5...	49.7	102.0....	73.8
100.0...	65.3	102.3....	79.0
101.0...	85.5	104.7....	90.4
		111.5....	97.8

Liquid–Liquid Equilibria (Metastable).
(The mixtures were cooled without being seeded with Sulfur.)

t°.	Wt. % S.	t°.	Wt. % S.
60.0...	27.35	94.8....	57.0
72.6...	32.8	95.2....	60.9
78.0...	35.8	96.0....	65.3
82.5...	39.0	95.5–96.2.	66.3
85.0...	41.5	96.5....	66.75
85.5...	41.9	94.8....	73.8
89.2...	45.4	93.9....	79.0
90.2...	46.8	92.6....	79.8
91.6...	49.5	91.9....	80.5
91.6...	49.7	85.4....	85.2
94.3...	55.4	70.0....	90.4
94.5...	55.5		

Solubility of Sulfur in Rubber.
(Venable and Greene, 1922.)

Thin strips of rubber stock, which had been compounded with 0 to 20 per cent of sulfur, were packed in flowers of sulfur and kept at desired temperatures untill equilibrium was established. The samples were then analyzed for free and combined sulfur. Equilibrium was approached from above and below, and was reached fairly quickly from below but from above, little of any of the excess sulfur migrated to the outside of the sheet. Consequently all the samples were given a preliminary heating to insure complete solution of the crystals before being placed in the pack. The results are given only in the form of curves and from these, the following approximate values were read. They show that the solubility increases as a « straight line function of the amount of combined sulfure up to a vulcanisation coefficient of about 7 ».

Per cent combined Sulfur.	Per cent free Sulfur at 55°.	75°.	95°.
1.0	2.8	4.8	7.1
3.0	2 9	5.2	8.1
5.0	3.0	5.4	9.1
7.0	3.1	5.8	10.0

Distribution of Sulfur Between Rubber and Amyl Alcohol and Between Rubber and *n* Butyl Alcohol.
(Kelly and Ayers, 1924.)

The determinations were made by two methods : (1) The sulfur was mixed with rubber and the mixture kept in contact with amyl alcohol. After attainment of equilibrium the sulfur in the amyl alcohol was determined. (2) The rubber was kept in contact with *n* butyl alcohol saturated with sulfur, and after attainment of equilibrium, the sulfur in the *n* butyl alcohol was determined.

Results for Rubber and Amyl Alcohol by method (1) and at 40°.

Per cent S in original S + Rubber mixture.	Distribution of Sulfur Gms. S per 100 gms. Amyl alcohol (C_2).	Rubber (C_1).	$\frac{C_2}{C_1}$.
0.42	0 0395	0.336	8.50
0.42	0.0395	0.342	8.68
0.80	0.0466	0.536	11.5
0.80	0.0455	0.556	12.5
0.95	0 0497	0.570	11.5
0.95	0.0499	0.592	11.8
1.21	0.0681	0.729	11.7
1.41	0.0783	0.850	10.7

Results for Rubber and *n* Butyl Alcohol by method (2) and at 30°.

Gms. Rubber per 100 cc. Butyl alc. sat. with S.	Distribution of Sulfur Gms. S per 100 gms. Butyl alcohol (C_4).	Rubber (C_2).	$\frac{C_2}{C_1}$.
2	0.168	0.840	5.0
4	9.148	0.79	5.3
6	0.136	0.72	5.3
8	0.123	0.67	5.4
10	0.109	0.64	5.9
12	0.106	0.55	5.2
14	0.098	0.52	5.3

The solubility of sulfur in *n* butyl alcohol at 30° was found to be 0.187 gm. S per 100 gms. alcohol. Assuming that the same ratio holds at saturation as that found by the distribution experiments, the solubility of sulfur in rubber was calculated to be ($0.187 \times 5.4 =$) 1.01 gm. S per 100 gms. rubber at 30°.

A series of experiments made by suspending slabs of rubber, having different coefficients of vulcanisation, in *n* butyl alcohol saturated with sulfur, and stirring gently, gave results for the solubility which increased linearly with the coefficient of vulcanisation up to a value of 17. This corresponds to the point where about 35 per cent of the double bonds of the rubber are saturated with sulfur. The results show that rubber dissolves but does not adsorb sulfur.

100 gms. sat. sol. of sulfur in selenium monochloride (Se Cl) contain 48.81 gms. S at 25°. (Lenher and Kao, 1926.)

Data for the freezing-points of mixtures of sulfur and tellurium are given by Losana, 1923.

Solubility of Sulfur in Toluene.

(Jacek, 1926; Delaplace, 1922; Hildebrand and Jenks, 1921.)

t°.	Gms. S per 100 gms. sat. sol.	t°.	Gms. S per 100 gms. sat. sol.	t°.	Gms. S per 100 gms. sat sol.
—58.25...	0.079 (J)	—16.0...	0.480 (J)	20...	1.827 (D)
—40.25...	0.169 »	—10.....	0.576 »	23...	1.889 »
—33.75...	0.214 »	0.....	0.923 »	25...	2.018 (H and J)
—28.50...	0.296 »	0.....	0.897 (H and J)	35...	2.722 »
—21.0....	0.380 »	13.....	1.515 (D)	54...	4.85 »
—17.75...	0.437 »	15.5...	1.649 (J)	83.5.	11.64 »

Experiments by Aten, 1918, showed that when rhombic sulfur is heated in sulfur chloride or toluene solutions, its solubility is increased, due to the transformation of rhombic sulfur to another form, $S\pi$. This is accompained by a change in the color of the solution. The increase in solubility is greater the more concentrated the original solution. The author studied the influence of temperature and of concentration, upon the transformation of ulfur dissolved in toluene. The mixtures containing different concentrations of sulfur, were heated respectively for 6 hours at 140°, 4 hours at 150° and 2 hours at 160°. They were cooled and the amount of sulfur remaining in solution after addition of a small quantity of rhombic sulfur and stirring for one hour at 0° was determined.

Mixtures heated at 140°.		Mixtures heated at 150°.		Mixtures heated at 160°.	
% concentration of original solution.	Gms. S per 100 gms. sat. sol. at 0°.	% concentration of original solution.	Gms. S per 100 gms. sat. sol. at 0°.	% concentration of original solution.	Gms. S per 100 gms. sat. sol. at 0°.
3.4	1.18	3.6	1.24	3.2	1.24
6.2	1.42	6.6	1.50	6.2	1.54
9.2	1.64	10.6	1.79	15.0	2.40
22.0	2.69	22.6	2.96	21.6	3.00
27.6	3.23	30.1	3.54	30.0	3.64

The quantity of $S\pi$ formed in CS_2 solutions is about equal to that formed in toluene and is much smaller than the quantity formed in sulfur chloride solutions.

Solubility of Sulfur in Para Xylene. (Hammick and Holt, 1926.)

Resuls for the Solid–Liquid Equilibria.			Results for the Liquid–Liquid Equilibria.					
t°.	Gms. S per 100 gms. sat. sol.	Solid Phase.	$t_1^0-t_2^0$.	Gms. S per 100 gms. sat. sol.	t_1^0	t_2^0	Gms. S per 100 gms. sat. sol.	$t_1^0-t_2^0$.	Gms. S per 100 gms. sat. sol.
92.5...	13.95	Rhombic S	about 80...	16.25	149–150...		34.9	184.....	81.0
100.5...	17.85	»	94.....	20.38	158–165...		39.9	175.....	85.6
85.0...	11.0	»	101–109...	21.8	167	174 (235)	44.0	156.....	85.5
107.0...	21.8	Monoclinic S	117–121...	25.9	171–179...		45.7	162–177 (187)	87.9
98.2...	16.25	»	124–129...	27.95	175–183 (220)		46.3	150–155 (203)	90.0
98.0...	16.3	»	130–134...	30.22	175–196 (206)		48.3	143–147 (205)	91.0
106.0...	20.38	»	137–141...	31.95	190.....		61.7	84....	96.2
103.3...	17.85		144–148...	34.6	190.....		71.2		

t_1^0 is the temperature at which the second liquid phase first dissolves.
t_2^0 is the temperature at which the second liquid phase finally dissolves.

The figures in parentheses show the temperatures at which mixtures that have become homogeneous at lower temperatures again separate into two liquid layers.

Solubility of Sulfur in Meta Xylene. (Hildebrand and Jenks, 1921.)

t°	25.	45.	80.
Gms. S per 100 gms. sat. sol.	1.969	3.604	10.29

SULFUR DIOXIDE SO_2.

Solubility of Sulfur Dioxide in Water.

Results of Hudson, 1925.

t°.	Gms. SO_2 (at partial pressure of 760^{mm} Hg) per 100 gms. H_2O.
10.	15.39
15.	12.73
20.	10.64
29.9	7.58
40.	5.54
48.15	4.39
60.	3.25
70.	2.61
80.	2.13
90.	1.805

Results of Smith and Parkhurst, 1922.

t°.	Pressure of SO_2 in mm. Hg.	Gms. SO_2 per 100 cc. H_2O.
5.	474.8	11.55
20.	198.6	2.97
20.	224.4	3.34
20.	366.6	5.22
20.	1107.8	15.01
40.	306.4	2.21
40.	373.8	2.68
60.	175.7	0.84

The determinations of Hudson were made by bubbling the gas through the solution untill saturation was reached. Especial care was taken to obtain accurate results. Attention is called to the sources of error in the determinations of Schönfeld, 1855.

In addition to the above results given by Smith and Parkhurst these authors also determined the solubility of sulfur dioxide in aqueous suspensions of calcium and magnesium hydroxides.

Freese, 1920, gives results for the solubility of sulfur dioxide in water which are identical with those of Schönfeld, 1855.

Partial Vapor Pressures of Aqueous Solutions of Sulfur Dioxide. (Sherwood, 1925.)

The author collected the available data on the partial vapor pressure of sulfur dioxide in water and from the plotted results constructed the following table. Heassumed that the dissociation is constant at any particular temperature and that Henry s law applies to the undissociated solute. On the basis of this assumption it has been shown (Haslam, Hershey and Keen, *Ind. Eng. Chem*, 16, 1225, 1924) that $S = Hp + \sqrt{KHp}$ or $\frac{S}{\sqrt{p}} = H\sqrt{p} + \sqrt{KH}$, when S = gms. SO_2 dissolved in 1000 gms. H_2O; p = partial pressure of SO_2 in mm. Hg; H = Henrys law constant and K = dissociation constant of the H_2SO_3. The results of Schönfeld, Sims, Roozeboom, Lindner, Freeze, Smith and Parkhurst and Watts, were used.

Gms. SO_2 per 1000 gms. H_2O.	Partial pressure of SO_2 in mm. Hg at 0°.	7°.	10°.	15°.	20°.	30°.	40°.	50°.
0.2	0.25	0.3	0.3	0.3	0.5	0.6	0.8	1.3
0.5	0.6	0.7	0.75	0.8	1.2	1.7	2.8	4.3
1.0	1.2	1.5	1.75	2.2	3.2	4.7	7.5	12 0
1.5	1.9	2.6	3.1	3.8	5.8	8.1	12.9	20.0
2.0	2.8	3.7	4.6	5.7	8.5	11.8	13.3	31.0
3.0	5.1	6.9	7.9	10.0	14.1	19.7	57.0	82.0
5.0	9.9	13.5	15.6	19.3	26.0	36.0	87.0	116.0
7.0	15.2	20.6	23.6	28.0	39.0	52.0	121.0	172.0
10.0	23.3	31.0	37.0	44.0	59.0	79.0	186.0	266.0
15.0	38.0	51.0	59.0	71.0	92.0	125.0	322.0	458.0
25.0	69.0	92.0	105.0	127.0	161.0	216.0	665.0	
50.0	148.0	198.0	226.0	270.0	336.0	452.0		
75.0	228.0	307.0	349.0	419.0	517.0	688.0		
100.0	308.0	417.0	474.0	567.0	698.0			
150.0	474.0	637.0	726.0					
200.0	646.0	657.0						

SOLUBILITY OF SULFUR DIOXIDE IN AQUEOUS SOLUTIONS OF POTASSIUM CHLORIDE AT A PARTIAL PRESSURE OF 760 MM. (Hudson, 1925.)

t°.	Gms. per 100 gms. H_2O. KCl.	SO_2.	t°.	Gms. per 100 gms. H_2O. KCl.	SO_2.	t°.	Gms. per 100 gms. H_2O. KCl.	SO_2.
10.....	5.55	17.05	29.9...	10.11	8.80	48.15..	32.72	6.18
10.....	10.22	18.58	29.9...	20.82	10.05	60.....	5 30	3.45
10.....	15.85	20.28	29.9...	29.86	11.26	60.....	10.67	3.52
10	20.78	21.96	40.0...	5.17	5.96	60.....	21.12	3.92
10.....	29.90	25.40	40.0...	10.20	6.32	60.....	30.98	4.24
15.....	10.39	15.32	40.0...	15.44	6.675	70.....	8.74	2.80
15.....	19.91	17.64	40.0...	20.14	7.07	70.....	21.68	3.05
15.....	30.71	20.59	40.0...	24.83	7.45	70.....	30.73	3.26
20.....	5.14	11.62	40.0...	28.95	7.75	80.....	8.66	2.27
20.....	10.30	12.52	48.15..	5.06	4.70	80.....	21.35	2.415
20.....	15.61	13.55	48.15..	10.14	4.945	80.....	29.68	2.52
20.....	24.98	15.38	48.15..	15.82	5 24	90.....	9.23	1.855
20.....	30.38	16.65	48.15..	21.11	5.48	90.....	19.49	1.97
29.9...	5.19	8.21	48.15..	25.09	5.74	90.....	32.75	2.11

SOLUBILITY OF SULFUR DIOXIDE IN AQUEOUS SOLUTIONS OF SODIUM SULFATE AT A PARTIAL PRESSURE OF 760 MM. (Hudson, 1925.)

Results at 20°. Gms. per 100 gms. H_2O. Na_2SO_4.	SO_2.	Results at 30°. Gms. per 100 gms. H_2O. Na_2SO_4.	SO_2.	Results at 40°. Gms. per 100 gms. H_2O. Na_2SO_4.	SO_2.	Results at 60°. Gms. per 100 gms. H_2O Na_2SO_4.	SO_2.
0.0	10.64	0.0	7.608	0.0	5.585	0.0	4.214
1.94	10.66	2.04	7.709	2.49	5.812	2.49	4.508
4.93	10.57	3.99	7.776	5.04	5.910	5.04	4.678
7.95	10.36	5.47	7.773	7.95	5.927	—	—
10.00	10.07	7.83	7.716	10.00	5.882	10.04	4.728
15.00	9.66	10.0	7.586	14.94	5.802	14.94	4.730
20.0	9.17	20.0	7.006	20.01	5.630	19.99	4.648

SOLUBILITY OF SULFUR DIOXIDE IN CONCENTRATED AQUEOUS SOLUTIONS OF SULFURIC ACID AT 20°. (Miles and Fenton, 1920.)

The solutions were saturated by means of a stream of SO_2 passing through the actively stirred mixture. The dissolved SO_2 was determined iodometrically.

Per cent H_2SO_4 in acid mixture.	Gms. SO_2 per 100 gms. acid mixture.	Per cent H_2SO_4 in acid mixture.	Gms. SO_2 per 100 gms. acid mixture.	Per cent H_2SO_4 in acid mixture.	Gms. SO_2 per 100 gms. acid mixture.
55.1	5.13	84.2	2.88	94.0	3.31
59.6	4.90	85.3	2.83	94.6	3.50
61.6	4.82	85.8	2.80	95.5	3.69
68.9	4.16	86.5	2.82	95.6	3.77
74.1	3.63	88.1	2.90	96.5	3.83
78.3	3.23	90.8	3.10	98.0	3.98
80.2	3.12	92.8	3.21	98.5	4.03
82.5	2.99	93.7	3.27		

RECIPROCAL SOLUBILITY OF LIQUID SULFUR DIOXIDE AND TOLUENE. (Zerner, Weisz and Opalzki, 1922.)

The accurately weighed mixtures were sealed in tubes of resistance glass and the temperatures determined at which clouding and clearing occured. The liquid SO_2 contained 0.56 % H_2O and 0.67 % oily residue.

t° of clouding.....	17.0.	21.0.	21.0.	13.5.	7.0.	About—25.0°.
Per cent SO_2 in mixture.	21.64	24.21	34.56	54.50	72.07	92.95

The correctness of the above results is questioned by Fontein, 1923, who points out that the observed clouding is due to the water content of the SO_2 used. A repetition of the determinations showed Zerner Weisz and Opulski that both toluene and tetralin are completely miscible with sulfur dioxide.

Freezing-point data for mixtures of SO_2 + toluene, SO_2 + benzene and SO_2 + tetraline are given by De Carli, 1926. 1926*a*.

SOLUBILITY OF SULFUR DIOXIDE IN RUBBER. (Venable and Fuwa, 1922.)

100 cc. of rubber saturated with sulfur dioxide at 21° dissolve 1950 cc. SO_2 (0° and 760 mm.). The determination was made by pumping out the gas with a Töpler pump and measuring it over mercury. In the same way 100 cc. of H_2O at 21° was found to dissolve 3, 661.7 cc. SO_2 (0° and 760 mm.). The authors also give results for the effect of pressure and temperature upon the solubility of sulfur dioxide in rubber.

SULFURIC ACID H_2SO_4.

Freezing-point data for mixtures of sulfuric acid and zinc sulfate (and a large number of other sulfates) are given by Kendall and Davidson, 1921.

TARTARIC ACID $C_2H_2(OH)_2(COOH)_2$.

SOLUBILITY OF TARTARIC ACID IN AQUEOUS SOLUTIONS OF ACETIC ACID, HYDROCHLORIC ACID AND OF SULFURIC ACID AT 25°. (Knox and Richards, 1919.)

Results for Acetic Acid. Equiv. Normality		Results for Hydrochloric Acid. Equiv. Normality		Results for Sulfuric Acid. Equiv. Normality	
CH_3COOH.	$C_2H_2(OH)_2(COOH)_2$.	HCl.	$C_2H_2(OH)_2(COOH)_2$.	H_2SO_4.	$C_2H_2(OH)_2(COOH)_2$.
0.25	10.09	0.0	10.260	1.798	8.51
0.60	9.875	1.257	8.528	4.043	6.64
1.23	9.515	2.568	7.092	6.807	4.73
2.63	8.717	4.466	5.434	9.895	3.18
4.25	7.718	6.303	4.350	12.54	2.43
6.12	6.548	8.144	3.77	15.46	1.95
8.30	5.151	9.89	3.43	18.10	1.77
10.89	3.505	10.51	3.42	19.85	1.86
14.14	1.594	11.17	3.42	22.17	2.74
16.92	0.344				

DISTRIBUTION OF TARTARIC ACID BETWEEN :

Water and Ether.

Results at 19°. (Schilow and Lepin, 1922.)

Gms. $C_2H_2(OH)_2(COOH)_2$ per 100 cc. of		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
16.70	0.0742	0.0044
33.60	0.154	0.0046
66.80	0.367	0.0055
107.4	0.890	0.0083
137.0*	1.600*	0.0117

Results at 25°. (Smith, 1921, 1922.)

Millimols. $C_2H_2(OH)_2(COOH)_2$ per liter of		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
8.40	0.625	0.0745
21.62	1.500	0.0694
37.55	2.562	0.0683
98.75	6.062	0.0613

* Excess solid present.

Acetone and Glycerol.

Results at 25°. (Smith, 1921, 1922.)

Millimols. $C_2H_2(OH)_2(COOH)_2$ per liter of		
Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
0.412	2.75	0.150
0.425	3.07	0.136
0.625	5.77	0.105
0.60	6.00	0.100
1.30	16.75	0.080

100 gms. 86.5 % glycerol ($d = 1.2326$) dissolve 115.5 — 161.7 gms. $C_2H_2(OH)_2(COOH)_2$ at 20°;

100 gms. 98.5 % glycerol ($d = 1.2645$) dissolve 69.5 — 114.7 gms. $C_2H_2(OH)_2(COOH)_2$ at 20°.

Saturation was approached from below and from above. In the latter case esters were formed and the higher results include the acid which had passed into solution in the form of ester. (Holm, 1921, 1922.)

TELLURIUM BROMIDES and IODIDES.

Thermal studies of the systems tellurium-bromine and tellurium-iodine are given by Damiens, 1920, 1921.

TELLURIUM OXIDE TeO_2.

Solubility of Tellurium Oxide in Aqueous Solutions of Hydrochloric Acid at 18°. (Kasarnawsky, 1924.)

The determinations were made by the conductivity method.

Mols. HCl per liter.	Mols. TeO_2 per liter.	Solid Phase.	Mols. HCl per liter	Mols. TeO_2 per liter.	Solid Phase.
0.10	$0.57.10^{-3}$	TeO_2	0 46	$3.70.10^{-3}$	TeO_2
0.22	1.20 »	»	0.92	9.10 »	»

TERPINEOL $\alpha C_{10}H_{18}O$ and $\beta C_{10}H_{18}O$.

Solubility of α Terpineol and of β Terpineol in Water. (Rhode, 1922.)

By means of a stalogmometric method (see Carvone, p. 1159) the solubility of α terpineol in water was found to be 1.98 gms. (= 0.0129 mols.) per liter at 15-20°. The result for β terpineol was 2.20 gms. (= 0.0143 mols.) per liter at 15-20°.

TETRALIN (1, 2, 3, 4-Tetrahydro Naphthalene) $C_{10}H_{12}$.

Solubility of Tetralin in Super-Heated Water. (Jaeger, 1926.)

The determinations were made in a large shaking autoclave. The air in the autoclave was previously displaced and mixtures of 500 cc. of the hydrocarbon and 2 liters of water were introduced and shaken 10 minutes at each temperature and allowed to stand 20 minutes. 500 cc. of the solution were withdrawn and after allowing about a day for the separation of the two layers the volume of the upper floating layer was carefully measured.

t°.....	150°.	200°.	250°.
Cc. $C_{10}H_{10}$ dissolved per 100 cc. H_2O.	0.02 (0.02)	0.04 (0.04–0.09)	0.40 (0.35-0.90)

Experiments made with various samples of hydrocarbons from generator tar, gas flame coal tar, etc., gave results (shown in parentheses) agreeing quite closely with those for tetralin.

TETRYL (Trinitro Phenyl Methyl Nitramine).

Solubility of Tetryl in Water.

(Taylor and Rinkenbach, 1923. The determinations are quoted in full by Desvergnes, 1924.)

The sample of tetryl used was purified by recrystallizing a good commercial product. Its setting point was 128°.72.

The saturated solutions were prepared in triplicate and equilibrium was approached from above and below. Constant agitation was not employed. The mixtures were shaken frequently for several hours and then allowed to settle two hours before a sample was removed for analysis. About 30-50 grams of the saturated solution were weighed in a wagon-pipet, the solvent evaporated, and the residue weighed after drying to constant weight. The determinations were plotted and the results for regular intervals of temperature were read from the curve.

t°.	Gms. Tetryl per 100 gms. H_2O.	t°.	Gms. Tetryl per 100 gms. H_2O.	t°.	Gms. Tetryl per 100 gms. H_2O.
0.....	0.0050	35.....	0.0094	70.....	0.0535
5.....	0.0058	40.....	0.0110	75.....	0.0663
10.....	0.0065	45.....	0.0140	80.....	0.0810
15.....	0.0072	50.....	0.0195	85.....	0.0980
20.....	0.0075	55.....	0.0270	90.....	0.1220
25.....	0.0080	60.....	0.0350	95.....	0.1518
30.....	0.0085	65.....	0.0440	100.....	0.1842

SOLUBILITY OF TETRYL IN SEVERAL ORGANIC SOLVENTS.
(Taylor and Rinkenbach, 1923. The results are quoted in full by Desvergnes, 1924.)

The same method was employed as that used for the determinations in water

	Gms. Tetryl per 100 gms. of each Solvent.				
t°.	95 % alcohol.	CCl_4.	$CHCl_3$.	CS_2.	$(C_2H_5)_2O$.
0.....	0.320	0.007	0.28	0.0090	0.188
5.....	0.366	0.011	0.33	0.0120	0.273
10.....	0.425	0.015	0.39	0.0146	0.330
15.....	0.496	0.020	0.47	0.0177	0.377
20.....	0.563	0.025	0.57	0.0208	0.418
25.....	0.65	0.031	0.68	0.0244	0.457
30.....	0.76	0.039	0.79	0.0296	0.493
35.....	0.91	0.048	0.97	0.0392	–
40.....	1.12	0.058	1.20	0.0557	–
45.....	1.38	0.073	1.47	0.0940	–
50.....	1.72	0.095	1.78	–	–
55.....	2.13	0.124	2.23	–	–
60.....	2.64	0.154	2.65	–	–
65.....	3.33	0.193	–	–	–
70.....	4.23	0.241	–	–	–
75.....	5.33	0.297	–	–	–

100 gms. glycol diacetate ($CH_3.CO\ O.CH_2.CH_2.O\ OC.CH_3$, b. pt. 188°-189°.6) dissolve about 14.0 gms. tetryl at 20-25°. (Taylor and Rinkenbach, 1926.)

Freezing-point data for mixtures of tetryl and trinitro toluene are given by Taylor and Rinkenbach, 1923 *a*.

THALLIUM BORATES, $TlBO_2$, Tl_3BO_3 and $Tl_4B_2O_5$.

Freezing-point data, for the system $Tl_2O + B_2O_3$, which show the formation of the above three compounds are given by Canneri and Morelli, 1922.

THALLI-THALLO BROMIDES, TlBr, $TlBr_3$, $[TlBr_6]Tl_3$, $[TlBr_4]Tl$.

SOLUBILITY OF THALLI-THALLO BROMIDES IN WATER. (Benrath, 1924.)

Gms. per 100 gms. H_2O			Gms. per 100 gms. H_2O		
$TlBr_3$.	TlBr.	Solid Phase.	$TlBr_3$.	TlBr.	Solid Phase.
	Results at 30°.			Results at 50°.	
0.0	0.073	TlBr (white)	1.701	0.542	TlBr (white)
0.233	0.91	»	1.992	0.670	»
1.147	0.204	»	2.351	0.669	$[TlBr_6]Tl_3$ (red)
1.556	0.272	»	3.082	0.680	»
1.990	0.356	$[TlBr_6]Tl_3$ (red)	3.591	0.738	»
2.293	0.315	»	4.110	0.879	»
2.851	0.380	»	4.251	0.926	$[TlBr_4]Tl$ (yellow)
3.490	0.379	»	4.763	0.901	»
3.865	0.448	»	5.286	0.891	»
4.163	0.435	$[TlBr_4]Tl$ (yellow)	6.632	0.880	»
5.062	0.425	»	8.511	0.874	»
6.980	0.415	»	10.256	0.883	»
9.241	0.403	»	13.056	0.851	»
11.917	0.349	»	15.554	0.941	»
14.596	0.364	»		Results at 80°.	
15.721	0.389	»	6.020	2.801	TlBr (white)
	Results at 50°.		6.211	2.972	$[TlBr_6]Tl_3$ (red)
0.0	0.159	TlBr (white)	7.515	3.250	»
0.478	0.210	»	8.014	3.193	$[TlBr_4]Tl$ (yellow)
0.651	0.251	»		Results at 90°.	
0.934	0.285	»	8.234	3.741	TlBr (white)
1.352	0.398	»	8.980	4.520	$[TlBr_6]Tl_3$ (red)
1.695	0.500	»	9.54	4.995	$[TlBr_4]Tl$ (yellow)

THALLIUM CHLORIDE (ous) Tl Cl.

1000 cc. sat. solution of thallous chloride in water contain 0.006095 gm. mols. Tl Cl at 0° and 0.014094 gm. mols. at 25°. The determinations were made by the electrolytic conductivity method. (Jones and Schumb, 1921.)

Solubility of Thallous Chloride in Aqueous Solutions of Salts.

(Butler and Hiscocks, 1926.)

Constant agitation was employed and equilibrium was approached from above and from below. The thallium was determined by titration with standard permanganate except in cases where thallous salts were used in the solvent.

Salt.	Mols. salt. per liter.	$d\frac{t°}{4}$ of sat. sol.	Mols. Tl Cl. per liter.
	Results at 0°.		
None (= Water)		1.0014	0.00670
KNO_3	0.05	1.0039	0.00787
»	0.20	1.0155	0.00955
»	0.50	1.0349	0.01184
»	1.00	1.0661	0.01472
$ZnSO_4$	0.05	1.0105	0.00875
»	0.10	1.0188	0.00979
»	0.30	1.0674	0.01214
»	0.5994	1.1015	0.01423
$La_2(SO_4)_3$	0.01	1.0063	0.00746
»	0.015	1.0088	0.00805
»	0.02	1.0110	0.00828
»	0.025	1.0135	0.00845
	Results at 25°.		
None (= Water)		1.0004	0.01607
KCl	0.05	1.0003	0.00586
»	0.10	1.0033	0.00387
»	0.20	1.0063	0.00258
»	0.50	1.0203	0.00176
$TlNO_3$	0.05	1.0078	0.00615
»	0.10	1.0202	0.00413
»	0.20	1.0399	0.00300
KNO_3	0.05	1.0038	0.01826
»	0.20	1.0138	0.02151
»	0.50	1.0327	0.02556
»	1.00	1.0619	0.03030
Tl_2SO_4	0.025	1.0098	0.00680
»	0.05	1.0186	0.00463
$ZnSO_4$	0.05	1.0097	0.01801
»	0.10	1.0184	0.01836
»	0.30	1.0515	0.01913
»	0.5994	1.0993	0.01937
$La_2(SO_4)_3$	0.01	1.0055	0.01801
»	0.015	1.0079	0.01836
»	0.02	1.0098	0.01913
»	0.025	1.0122	0.01937
	Results at 50°.		
None (= Water)		0.9950	0.03265
KCl	0.05	0.9943	0.01835
»	0.10	0.9957	0.01281
»	0.20	0.9996	0.00893
»	0.50	1.0121	0.00606
$TlNO_3$	0.10	1.0131	0.01381
»	0.20	1.0321	0.01010
Tl_2SO_4	0.025	1.0012	0.02061
»	0.05	1.0140	0.01567
KNO_3	0.05	0.9989	0.03598
»	0.20	1.0088	0.04136
»	0.50	1.0273	0.04794
»	1.00	1.0571	0.05524
$ZnSO_4$	0.05	1.0046	0.04027
»	0.10	1.0249	0.04457
»	0.30	1.0459	0.05349
»	0.5994	1.0952	0.06163

Solubility of Thalli-Thallo Chlorides in Water at 35°.

(Benrath, 1924.)

Gms. per 100 gms. H_2O		
$TlCl_3$.	Tl Cl.	Solid Phase.
0.0	0.051	Tl Cl (white)
0.169	0.373	$[TlCl_6]Tl_3$ (yellow)
0.823	0.265	»
2.173	0.237	»
2.872	0.232	»
3.566	0.216	»
4.444	0.236	»
8.723	0.237	»
15.097	0.272	»
28.109	0.244	»
39.940	0.314	»
74.401	0.770	$[TlCl_6]Tl_3$ (yellow)
88.510	1.021	»
118.875	1.536	»
144.782	2.272	»
157.161	2.695	»
160.502	2.917	»
163.291	2.887	$[TlCl_4]Tl$ (white)
166.434	2.826	»
172.971	2.779	»
197.997	2.653	»

SOLUBILITY OF THALLI-THALLO CHLORIDES IN WATER AT SEVERAL TEMPERATURES.
(Benrath, 1924.)

Gms. per 100 gms. H_2O		
$TlCl_3$.	TlCl.	Solid Phase.
Results at 45°		
0.0	0.070	TlCl (white)
0.214	0.496	$[TlCl_6]Tl_3$ (yellow)
1.875	0.405	»
4.954	0.356	»
20.184	0.426	»
39.561	0.495	»
65.597	0.803	»
90.693	1.187	»
117.654	1.976	»
144.840	3.115	»
156.167	3.771	»
166.853	4.424	»
171.000	4.400	$[TlCl_4]Tl$ (white)
195.820	4.361	»
209.542	4.302	»
Results at 55°		
0.0	0.092	TlCl (white)
0.291	0.678	$[TlCl_6]Tl_3$ (yellow)
1.327	0.593	»
4.458	0.586	»
26.501	0.532	»

Gms. per 100 gms. H_2O		
$TlCl_3$.	TlCl.	Solid Phase.
40.512	0.698	$[TlCl_6]Tl_3$ (yellow)
88.845	1.995	»
120.601	3.006	»
155.838	5.412	»
157.413	5.587	»
163.985	6.215	»
167.913	6.669	»
177.163	6.687	$[TlCl_4]Tl$ (white)
183.968	6.612	»
201.022	6.578	»
214.579	6.493	»
Results at 70°		
178.31	10.356	$[TlCl_6]Tl_3$ (yellow)
187.16	10.580	$[TlCl_4]Tl$ (white)
Result at 80°		
179.82	15.291	$[TlCl_6]Tl_3$ (yellow)
225.37	16.013	»
245.20	15.920	$[TlCl_4]Tl$ (white)
Results at 90°		
287.41	20.085	$[TlCl_6]Tl_3$ (yellow)
290.83	19.876	$[TlCl_4]Tl$ (white)

THALLIUM CHROMATE Tl_2CrO_4.

SOLUBILITY OF THALLIUM CHROMATE IN WATER AND IN AQUEOUS SOLUTIONS AT 20°.
(Moser and Brukl, 1926.)

Constant agitation was employed for securing saturation.

Solvent.	Gms. Tl_2CrO_4 per liter sat. sol.	Solvent.	Gms. Tl_2CrO_4 per liter sat. sol.
Water	0.0427	Aq. 2 % NH_3 + 1 % K_2CrO_4	0.0100
Aq. 60 % Ethyl Alcohol	0.0092	» » » + 2 % »	0.0095
» 70 % » »	0.0080	» 5 % » + » »	0.0142
» 80 % » »	0.0072	» 10 % » + » »	0.0205
» 96 % » »	0.0060	» 2 % » + 4 % » + 10 % Alcohol	0.0060

THALLIUM IODIDE (ous) TlI.

1000 cc. sat. solution of thallous iodide in water contain 0.0000587 gm. mol. TlI at 0° and 0.000235 gm. mol. at 25°. The determinations were made by the electrolytic conductivity method. (Jones and Schumb, 1921.)

THALLIUM LAURATE $C_{12}H_{23}O_2Tl$ (m. pt. 125°-6°).

100 gms. sat. sol. of thallium laurate in aq. 50 % ethyl alcohol contain 1.51 gms. $C_{12}H_{23}O_2Tl$ at 15°. (Halde and Takehara, 1925.)

THALLIUM MYRISTATE $C_{14}H_{27}O_2Tl$ (m. pt. 120°-123°.)

100 gms. sat. sol. of thallium myristate in aq. 50 % ethyl alcohol contain 0.53 gm. $C_{14}H_{27}O_2Tl$ at 15°. (Halde and Takehara, 1925.)

THALLIUM NITRATE $TlNO_3$.

The freezing-point curve for the system thallium nitrate + thallium nitrite shows that a continuous series of mixed crystals is formed. (Cuttica, 1920.)

THALLIUM OLEATE $C_8H_7CH:CH(CH_2)_7COOTl$ (m. pt. 83°, cor.).

THALLIUM PALMITATE $CH_3(CH_2)_{14}COOTl$ (m. pt. 115°–117°).

THALLIUM STEARATE $CH_3(CH_2)_{16}COOTl$ (m. pt. 119°, cor.).

SOLUBILITY OF EACH SEPARATELY IN WATER AND IN 96 % ETHYL ALCOHOL. (Holde and Selim, 1925.)

The numerical results are not given but only small scale diagrams, from which the following approximate values were read.

	Solubility in Water. Gms. per 100 gms. sat. solution			Solubility in 96 % Alcohol. Gms. per 100 gms. sat. solution		
t°.	Tl Oleate.	Tl Palmitate.	Tl Stearate.	Tl Oleate.	Tl Palmitate.	Tl Stearate.
15.....	0.04	0.015	0.005	2.2	0.35	0.1
20.....	0.05	0.025	0.006	2.5	0.4	0.1
25.....	0.06	0.030	0.008	2.75	0.5	0.1
30.....	0.07	0.035	0.010	3.05	0.6	0.1
35.....	–	–	–	3.75	0.75	0.1
40.....	0.09	0.045	0.020	7.5	1.0	0.1
45.....	–	–	–	15.0	1.35	0.15
50.....	0.11	0.055	0.030	–	–	0.25
60.....	0.15	0.07	0.050	–	–	0.75
70.....	0.20	–	0.075			
80.....	0.30	–	0.110			

100 gms. sat. solution of thallium oleate in aq. 50 % alcohol contain 0.92 gms of the salt at 15°. (Holde and Selim, 1925.

THALLIUM SELENATES $TlH(SeO_4)_2.2H_2O$ and $Tl(OH)SeO_4.H_2O$.

The system $Tl_2O_3 + SeO_3 + H_2O$ at 25° is described by Meyer and Wilk, 1924, but numerical data are not given. It is stated that the curve is almost identical with that of selenium sulfate but the transition point is at 45 % H_2SeO_4 instead of at 40 %.

THALLIUM SULFATE Tl_2SO_4.

SOLUBILITY OF THALLIUM SULFATE IN WATER. (Cohen, de Meester and Moesveld, 1924).

The authors used a specially designed apparatus and observed all precautions necessary for determinations of the highest accuracy.

t°.....	30.0.	49.9.	60.0.
Gms. Tl_2SO_4 per 100 gms. sat. sol.....	5.83	8.43	9.79

SOLUBILITY OF THALLIUM SULFATE IN WATER AT 30° AND UNDER HIGH PRESSURES. (Cohen, Voller and Moesveld, 1923.)

Pressure in atmospheres.....	1	500	1000	1500
Gms. Tl_2SO_4 per 100 gms. sat. sol....	5.83	7.48	9.03	10.50

SOLUBILITY OF THALLIUM OXIDE (Tl_2O_3) IN AQUEOUS SOLUTIONS OF SULFURIC ACID AT 25°. (Meyer, 1923; Meyer and Wilk, 1924.)

Constant agitation in a thermostat was employed.

	Gms. per 100 cc. Aq. Sulfuric Acid		
Per cent H_2SO_4.	Tl_2O_3.	$Tl(OH)SO_4.2H_2O$.	$HTl(SO_4)_2.4H_2O$.
20.....	16.2	25.2	–
40.....	9.8	15.2	–
50.....	2.52	–	2.9
70.....	0.30	–	0.61

The diagram given by the authors contains three branches, corresponding respectively to the solubility of Tl_2O_3 in dilute sulfuric acid and of the two sulfates, $Tl(OH)SO_4.2H_2O$ and $HTl(SO_4)_2.4H_2O$, in stronger acid. The existence of the basic salt $Tl(OH)SO_4.2H_2O$ requires a concentration of at least 10 % H_2SO_4. The space diagram but not the numerical data is given for determinations at temperatures between 20° and 95°.

THALLI-THALLO SULFATE $Tl_2SO_4.Tl_2(SO_4)_3$.

SOLUBILITY OF THALLI-THALLO SULFATE IN AQUEOUS 16.36 PER CENT SULFURIC ACID.

(Benrath and Espenschied, 1922.)

t°.	Gms. $Tl_2SO_4.Tl_2(SO_4)_3$ per 100 gms. sat. sol.	t°.	Gms. $Tl_2SO_4.Tl_2(SO_4)_3$ per 100 gms. sat. sol.
48.5	17.26	61.0	16.89
55.2	16.69	65.5	16.23
60.5	16.89	83.5	15.35

The density of the aqueous H_2SO_4 was 1.115. Below 48° the ratio of Tl (1) and Tl (3) in the solution is no longer 1:1 as required for the double salt.

THALLIUM SULFIDE Tl_2S.

1000 cc. aq. 0.01 normal H_2SO_4, saturated with H_2S at 1 atmosphere pressure, dissolve 1.451 gms. Tl_2S at 20°. (Moser and Behr, 1924.)

THEBAINE $C_{19}H_{21}NO_3$.

SOLUBILITY OF THEBAINE IN WATER. (Kolthoff, 1925.)

The dissociation constant was calculated, from colorimetric p_H measurements in mixtures of 0.01 *n* thebain hydrochloride and 0.01 *n* Na OH solutions, to be $K = 9.10^{-7}$. For the determination of the solubility product it was found that a mixture of 5 cc. of a 0.01 *n* thebaine hydrochloride solution and 0.9 cc. of 0.01 *n* NaOH gave a slight crystalline deposit after 4 hours. The p_H of the solution was 7.6. Calculating from this experiment, $L_{Thebaine} = 2.10^{-9}$. From this value and the dissociation constant, the solubility of thebaine in water was calculated to be $2.2.10^{-3}$ mols. or 0.685 gms. per liter at 15°.

THEBAINE PICRATE $C_{19}H_{21}NO_3.HOC_6H_2(NO_2)_3$.

100 gms. sat. sol. of Thebaine picrate in water contain 0.20 gm. of the salt at 20°.
" " " " " " abs. alcohol " 0.10 " " " " " "
" " " " " " acetone " 10.1 " " " " " "

(Maplethorpe and Evers, 1925.)

THEOBROMINE (3.7 Dimethyl Xanthine) $C_5H_2(CH_3)_2N_4O_2$.

SOLUBILITY OF THEOBROMINE IN SEVERAL SOLVENTS. (Wadsworth, 1920.)

The method of obtaining saturation and analysis of the solutions is not described.

Solvent.	Gms. Theobromine per 100 cc. sat. sol. at 15°.5.	b. pt.	Solvent.	Gms. Theobromine per 100 cc. sat sol. at 15°.5.	b. pt.
Water	0.060	0.700	Benzene	0.005	0.010
Aq. 90 % ethyl alcohol.	–	0.390	Carbon tetrachloride	0.020	0.040
Absolute " "	–	0.100	Chloroform	0.060	0.070
Acetylene tetrachloride.	0.090	0.870	Ethyl ether	0.003	0.003
Aniline	0.650	8.000	Trichlor ethylene	0.020	0.030

100 gms. amyl alcohol dissolve 0.02 gm. theobromine at 15°. (Debourdeaux, 1917.)

DISTRIBUTION OF THEOBROMINE BETWEEN : (Aiello, 1921.)

Water and Olive Oil.

t°.	Gms. Theobromine per 100 cc. Aq. layer (*a*).	Oil layer (*o*).	$\frac{o}{a}$.
16	0.041	0.059	1.45
17	0.037	0.063	1.70

Horse Serum and Olive Oil.

t°.	Gms. Theobromine per 100 cc. Serum layer (*s*).	Oil layer (*o*).	$\frac{o}{s}$.
20	0.153	0.057	0.37
20	0.153	0.067	0.43

THEOPHYLLINE (1.3 Dimethyl Xanthine) $C_5H_2(CH_3)_2N_4O_2$.

DISTRIBUTION OF THEOPHYLLINE BETWEEN : (Aiello, 1921.)

Water and Olive Oil.

t°.	Gms. Theophylline per 100 cc. Aq. layer (*a*).	Oil layer (*o*).	$\frac{o}{a}$.
18	0.200	0.300	1.50
18	0.363	0.637	1.75

Horse Serum and Olive Oil.

t°.	Gms. Theophylline per 100 cc. Serum layer (*s*).	Oil layer (*o*).	$\frac{o}{s}$.
19	0.054	0.057	0.94
20	0.065	0.044	0.67

THIACETIC ACID CH_3COSH.

DISTRIBUTION OF THIACETIC ACID AT 25° BETWEEN ‡ (Smith, 1921, 1922.)

Water and Ethyl Ether. Millimols. CH_3COSH per liter.			Acetone and Glycerol. Millimols. CH_3COSH per liter.		
H_2O layer (C_1).	$(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$	Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$
0.967	0.802	0.830	3.04	1.56	1.95
1.39	1.165	0.839	5.36	2.36	2.27
3.175	2.675	0.843	9.40	3.60	2.62
6.00	5.30	0.884	14.30	4.60	3.10
9.70	8.50	0.877	30.10	9.40	3.20

THORIUM CHROMATE $Th(CrO_4)_2.3H_2O$.

EQUILIBRIUM IN THE SYSTEM THORIUM OXIDE, CHROMIC ANHYDRIDE AND WATER AT 25°. (Britton, 1923.)

The solutions were saturated by constant stirring in a thermostat. The solid phases were identified by analysis according to the « rest method ».

Gms. per 100 gms. sat. sol.			Gms. per 100 gms. sat. sol.		
ThO_2.	CrO_3.	Solid Phase.	ThO_2.	CrO_3.	Solid Phase.
0.044	0.033	$Th(CrO_4)_2.3H_2O$	23.04	40.23	$Th(CrO_4)_2.CrO_3.3H_2O$
0.452	1.376	»	21.59	41 56	»
2.09	4.58	»	17 08	44.20	»
3.08	7.15	»	7.91	52.60	»
6.52	13.09	»	7.52	56.79	»
11.27	21.75	»	9.09	57.57	»
15.62	28.00	»	17.65	61.38	» + CrO_3
22.87	37.27	»	6.27	61.84	CrO_3
23.25	37.45	»	0.0	62.87	»
24.22	39.49	» + $Th(CrO_4)_2.CrO_3.3H_2O$			

THORIUM FLUORIDE $ThF_4.4H_2O$.

1000 cc. sat. solution of thorium fluoride in water contain 0.17 gm. ThO_2 at 25°. (Spitzen, 1917.)

THORIUM Potassium FLUORIDE $ThK_2F_6.4H_2O$.

1000 cc. sat. sol. of thorium potassium fluoride in water contain 0.4 gm. ThO_2 at 25°. (Spitzen, 1917.)

THORIUM OXALATE $Th(C_2O_4)_2.6H_2O$.

SOLUBILITY OF THORIUM OXALATE IN AQUEOUS SOLUTIONS OF AMMONIUM OXALATE AT 25°. (Spitzen, 1917.)

Constant mechanical shaking was employed. In the case of dilute solutions two liters of solvent were used and for the more concentrated, 100 to 200 cc. A period of six hours shaking was found to be sufficient.

Gm. mols. $(NH_4)_2C_2O_4$ per liter.	Gm. ThO_2 per liter.	Gm. mols. $(NH_4)_2C_2O_4$ per liter.	Gm. ThO_2 per liter.	Gm. mols. $(NH_4)_2C_2O_4$ per liter.	Gm. ThO_2 per liter.
0.00(=water)	0.00007	0.0075	0.070	0.0300	0.600
0.0006	0.0023	0.0100	0.100	(0.0410)	(0.410)
0.0010	0.0040	0.0150	0.180	0.0500	1.000
0.0025	0.010	0.0200	0.340	(0.0900)	(5.550)
0.0050	0.040	0.0250	0.450		

SOLUBILITY OF THORIUM OXALATE IN VARIOUS AQUEOUS SOLUTIONS AT 25°. (Spitzen, 1917.)

Aq. solvent.	Gm. ThO_2 per liter.	Aq. solvent.	Gm. ThO_2 per liter.	Aq. solvent.	Gm. ThO_2 per liter.
0.1 *n* NH_4Cl...	0.0003	0.5 *n* HBr	0.0115	0.5 *n* $C_4H_6O_6$..	0.0040
0.1 *n* $(NH_4)_2SO_4$.	0.0010	0.5 *n* HI	0.0112	0.5 *n* CCl_3COOH...	0.0120
0.1 *n* NaCl.....	0.0002	0.5 *n* H_2CrO_4...	0.0110	0.5 *n* $KHSO_4$...	0.0300
0.1 *n* Na_2SO_4...	0.0006	0.5 *n* $HClO_4$....	0.0130	1.0 *n* » ..	0.0770
		0.5 *n* H_3BO_3...	0.0001		

SOLUBILITY OF THORIUM OXALATE AT 25° IN AQUEOUS SOLUTIONS OF : (Spitzer, 1917.)

Sulfuric Acid.				Hydrochloric Acid.		Nitric Acid.	
Normality of Aq. H_2SO_4.	Gm. ThO_2 per liter.	Normality of Aq. H_2SO_4.	Gm. ThO_2 per liter.	Normality of Aq. HCl.	Gm. ThO_2 per liter.	Normality of Aq. HNO_3.	Gm. ThO_2 per liter.
0.007	0.0008	0.49	0.053	0.04	0.0006	0.016	0.0003
0.02	0.0020	0.50	0.055	0.09	0.0017	0.06	0.0013
0.03	0.0030	0.58	0.060	0.23	0.0047	0.24	0.0045
0.06	0.0069	0.90	0.090	0.38	0.0070	0.47	0.0101
0.10	0.0120	0.98	0.108	0.48	0.0085	0.50	0.0110
0.20	0.0180	(1.00)	(0.120)	0.50	0.012	0.78	0.0144
0.40	0.0430	1.18	0.120	0.64	0.016	1.00	0.0330
0.48	0.0460			0.82	0.021		
				1.00	0.024		

The thorium oxalate was prepared from thorium nitrate by precipitation in a hot solution of oxalic acid and washing with hot water.

SOLUBILITY OF THORIUM OXALATE AT 25° IN AQUEOUS SOLUTIONS OF SULFURIC ACID SATURATED WITH CERIUM OXALATE ($Ce_2(C_2O_4)_3.10H_2O$). (Spitzer, 1917.)

Normality of Aq. H_2SO_4.	Gm. ThO_2 per liter.	Normality of Aq. H_2SO_4.	Gm. ThO_2 per liter.
0.014	0.0009	0.47	0.015
0.050	0.0030	0.63	0.019
0.100	0.0040	0.90	0.043

THORIUM OXIDE ThO_2.

SOLUBILITY OF THORIUM OXIDE IN VARIOUS AQUEOUS SOLUTIONS AT 25° (Spitzer, 1917.)

Aq. solvent.	Gm. ThO_2 per liter.	Aq. solvent.	Gm. ThO_2 per liter.
Water.....	less than 0.00002	Aq. 0.8 *n* $C_4H_8O_4$..	0.0003
Aq. 1.0 *n* K_2CO_3..	» » 0.00002	Aq. 1.0 *n* HCl... ..	0.0005
Aq. 1.0 *n* Na_2CO_3..	» » 0.00003	Aq. 1.0 *n* HNO_3....	0.0006
Aq. 1.0 *n* NaOH...	» » 0.00005	Aq. 1.0 *n* H_2SO_4....	0.0020

THORIUM PHOSPHATE $ThP_2O_6.11H_2O$.

SOLUBILITY OF THORIUM PHOSPHATE IN AQUEOUS SOLUTIONS AT 25°. (Spitzer, 1917.)

Aq. solvent.	Gm. ThO_2 per liter.	Aq. solvent.	Gm. ThO_2 per liter.
Aq. 1.0 *n* HNO_3.....	0.012	Aq. 1.0 *n* H_2SO_4.....	0.053
Aq. 1.0 *n* HCl.....	0.024	Aq. 1.0 *n* K_2CO_3.....	0.250

THORIUM Thallium SULFATE $2Th(SO_4)_2.7Tl_2SO_4.3H_2O$.

SOLUBILITY OF THORIUM THALLIUM SULFATE IN WATER. (Fernandez, 1925.)

t°.	Gm. ThO_2 per 100 cc. H_2O.	t°.	Gm. ThO_2 per 100 cc. H_2O.	t°.	Gm. ThO_2 per 100 cc. H_2O.
0.....	0.280	40.....	0.584	80.....	0.712
10.....	0.340	50.....	0.658	90.....	0.690
20.....	0.415	60.....	0.696	100.....	0.630
30.....	0.500	70.....	0.714		

THYMOL (3 Methyl 6 Iso propyl Phenol) $C_3H_7.C_6H_3.OH.CH_3$.

SOLUBILITY OF THYMOL IN WATER.

By means of a stalogmometric method (see Carvone, p. 1159) the solubility of thymol in water was found by Rhode, 1922, to be 5.7 millimols, or 0.876 gms., per liter at 15-20°.

Approximate determinations of the solubility of thymol in water made by analysis of the saturated solution (temperature of saturation not stated) and by measuring its freezing-point gave, respectively, 0.78 and 1.11 gm. thymol per liter. (Vladesco, 1922.)

Solubility of Thymol in Aqueous Solutions of Glycerol at 25°.
(Marquina, 1917.)

The saturated solutions were analyzed by the Messinger and Vortmann method as modified by Redman, Werth and Brock.

Wt. per cent Glycerol in solvent.	Gms. Thymol per 100 gms. sat. sol.	Wt. per cent Glycerol in solvent	Gms. Thymol per 100 gms. sat. sol.
0.0 (= water)	0.0952	75.10	0.433
20.01	0.114	85.15	0.695
24.95	0.126	100.00	1.71
50.19	0.193		

100 gms. para cymene (b. pt. 176°-176°.5) dissolve 113.85 gms. thymol at 25°.
(Wheeler, 1920.)

TIN Tetra BROMIDE $SnBr_4$.

Solubility of Tin Tetra Bromide in Liquid Sulfur Dioxide.
(Bond and Beach, 1926.)

The synthetic method was used and a special procedure was divised to prevent contact with moisture.

t°.	Per cent $SnBr_4$.	Solid Phase.	t°.	Per cent $SnBr_4$.	Solid Phase.
29.45.....	100.00	$SnBr_4$	39.75.....	40.63	liquid layers
24.90.....	98.74	»	25.00.....	26.09	»
21.15.....	97.30	»	*18.42.....	21.67	»
18.80.....	96.24	»	16.3 Quad. pt.	21.67	»+SO_2
18.00.....	95.62	»	*16.6.....	20.39	»
16.60.....	94.12	»	*8.0, 13.2.....	16.55	»+SO_2
16.55 Quad. pt.	94.07	»+liquid layer	*1.8, 10.7.....	14.08	» »
18.33.....	93.67	liquid layer	*—17.8, 7.1.....	11.88	» »
23.60.....	92.75	»	5.45.....	10.61	SO_2
28.70.....	91.65	»	3.25.....	9.45	»
34.25.....	89.81	»	2.5.....	8.93	»
42.60.....	85.54	»	— 3.5.....	6.29	»
45.75.....	82.49	»	— 5.0.....	5.37	»
47.25.....	80.31	»	—17.1.....	2.97	»
47.70.....	78.97	»	—21.8.....	2.41	»
48.60.....	75.14	»	—24.0.....	1.88	»
48.6 crit. t....	71.38	»	—37.7.....	0.92	»
48.50.....	64.00	»	—45.7.....	0.58	»
46.30.....	52.83	»	—53.05.....	0.39	»
41.67.....	43.60	»			

* Unstable points.

TIN Tetra CHLORIDE $SnCl_4$.

Solubility of Tin Tetra Chloride in Liquid Sulfur Dioxide.
(Bond and Beach, 1926).

t° of m. pt.	t° of solubility.*	Per cent $SnCl_4$.	t° of m. pt.	t° of solubility.	Per cent $SnCl_4$.
—32.7		100.00	—43.8	—45.0	67.47
—38.7		95.23	—43.8	—45.0	66.06
—40.6		92.66	—43.9	—45.1	61.54
—42.6	—52.0	86.16	—44.0	—45.3	58.54
—43.25	—46.8	82.41	—44.1	—45.9	55.24
—43.6	—45.7	79.43	—44.3	—46.3	50.76
—43.6	—45.7	79.05	—44.8	—48.8	44.27
—43.4	—45.6	76.07	—47.1	—57.5	31.96
—43.4	—45.4	75.76	—49.8		26.29
—43.6	—44.9	72.62	—63.0		11.78
—43.7	—44.9	71.75	—72.7		5.40

* The temperature of solubility is that at which metastable liquid layers separate.

100 gms. sat. solution of tin tetra chloride in selenium oxychloride ($SeOCl_2$) contain 13.74 gms. $SnCl_4$ at 25°. (Wise, 1923.)

Methyl, Ethyl, etc. TIN FLUORIDES.

Solubility of Each Separately in Several Solvents. (Krause, 1918.)

Compound.	Formula.	t°.	Gms. compound per 100 gms. CH_3OH.	C_2H_5OH.	H_2O.	C_6H_6.
Trimethyl Tin Fluoride	$(CH_3)_3SnF$	31.3	2.45	1.08	0.846	0.005
Triethyl »	$(C_2H_5)_3SnF$	32.3	4.39	2.20	0.182	0.034
Tri *n* propyl »	$(n\,C_3H_7)_3SnF$	31.3	4.26	2.73	0.020	0.118
Tri isobutyl »	$(i\,C_4H_9)_3SnF$	31.6	0.614	0.414	0.012	0.100
Tri isoamyl »	$(i\,C_5H_{11})_3SnF$	31.3	1.22	1.03	0.003	0.967
Diethyl *n* propyl »	$(C_2H_5)_2(n\,C_3H_7)SnF$	31.0	6.93	3.78	0.12	0.005
Dimethyl Tin Difluoride	$(CH_3)_2SnF_2$	30.7	0.33	0.081	4.66	–
Diethyl »	$(C_2H_5)_2SnF_2$	30.8	2.64	0.45	2.03	0.047
Di *n* propyl »	$(n\,C_3H_7)_2SnF_2$	32.0	1.91	0.93	0.22	–

TIN Nitroso β Phenyl HYDROXYLAMINE.

100 gms. H_2O dissolve 2.10^{-5} gm. of the Stannic (Sn^{IV}) Compound at 18°. (Martin.)
$3.5.10^{-5}$ » Stannous (Sn^{II}) » »

TITANIUM Tetra CHLORIDE $TiCl_4$.

100 gms. sat. solution of titanium tetrachloride in selenium oxychloride ($SeOCl_2$) contains 0.75 gm. $TiCl_4$ at 25°. (Wise, 1923.)

TITANIUM Potassium Hexa FLUORIDE TiK_2F_6.

1000 cc. sat. solution of titanium potassium hexa fluoride in aq. 0.125 *n* hydrofluoric acid contain 0.0483 gm. mols. TiK_2F_6 at 20°. (V. Hevesy, Christiansen and Berglund, 1925.)

TITANIUM OXIDE TiO_2.

Solubility of Titanium Oxide in Aqueous Solution of Alkalis. (Auger, 1923.)

Solvent.	Gm. TiO_2 per liter.	Solvent.	Gm. TiO_2 per liter.
Aq. 10 per cent NaOH...	0.02–0.025	Aq. 12 per cent $KHCO_3$.....	0.50
» 36 » » ...	0.06–0.10	» 25 » »	2.75
» 10 » KOH....	0.30–0.45	» saturated »	7.00
» 40 » »	0.70–0.90	» 30 per cent K_2CO_3	0.02
» 10 » $NaHCO_3$.	0.25	» saturated »	0.30

The temperature is not stated and the manner in which the determinations were made is not clearly described.

Hydroxy TOLUALDEHYDES $C_6H_3.CHO.OH.CH_3$, 1, 2, 5; 1, 4, 5 and 1, 4. 6.

Solubility of Each Separately in Water. (Sidgwick and Allott, 1923.)

The determinations were made by the synthetic, sealed tube, method. The concentrations are in terms of wt. %, that is, grams of each compound per 100 gms. sat. solution. The points at which a second liquid layer separated are marked L. The unstable points are marked with an asterisk.

Results for $C_6H_3.(1)CHO.(2)OH.(5)CH_3$.		Results for $C_6H_3.(1)CHO.(4)OH.(5)CH_3$.				Results for $C_6H_3.(1)CHO.(4)OH.(6)CH_3$.			
t°.	Wt. %.	t°.	Wt. %.	t°.	Wt. %	t°	Wt. %.	t°.	Wt. %.
99.1	2.52 L	67.3	1.69	87.2	56.0 L	56.8	5.78	69.1[b]	50.6
156.5	5.47 L	55.9	1.69 L*	79.5[b]	56.0	85.8	7.95 L	69.2	51.0
		99.3	5.45 L	79.6	59.9	116.3	14.3 L	69.4	59.5
137.1	92.73 L	127.0	16.5 L	80.3	73.3	125.0[a]	34.0 L	69.9	69.5
87.7	96.09 L	133.5	23.5 L	91.2	86.8	124.5	44.6 L	75.9	82.7
55.1	100.00	136.8[a]	35.4 L	117.4	100.0	121.1	48.5 L	108.9	100.0
		127.0	52.5 L	[a] Crit. t. [b] Tr. pt.		78.8	50.3 L		

SOLUBILITY OF EACH SEPARATELY IN BENZENE. (Sidgwick and Allott, 1923.)

Results for $C_6H_3.(1)CHO.(2)OH.(5)CH_3$.

t°.	Wt. %.
5.32.....	0.0 B
3.45.....	5.56 B
1.30.....	11.50 B
−0.60.....	17.0 B
−2.40.....	21.5 B
−3.0 Eutec..	23.3
+0.15.....	27.4
6.05.....	34.0
11.5.....	41.7
21.6.....	55.4
28.0.....	64.4
31.8.....	71.0
46.0.....	90.9

Results for $C_6H_3.(1)CHO.(4)OH.(5)CH_3$.

t°.	Wt. %.
37.2.....	2.27
66.7.....	7.08
72.4.....	11.7
76.0.....	18.8
79.8.....	26.9
83.7.....	38.6
85.8.....	48.4
92.1.....	63.0
98.2.....	73.9
117.4.....	100.0

Result for $C_6H_3.(1)CHO.(4)OH.(6)CH_3$.

t°.	Wt. %.
54.7.....	4.94
67.5.....	8.19
72.9.....	17.5
75.7.....	33.2
81.8.....	53.3
86.7.....	67.5
89.1.....	71.5
108.9.....	100.0

B indicates that solid benzene separated.

TOLUENE $C_6H_5CH_3$.

SOLUBILITY OF TOLUENE IN WATER.

t°.	Cc. $C_6H_5CH_3$ per 100 cc. H_2O.	Authority.
16.....	0.057	Führer, 1924
25 (?)..	0.063	Horiba, 1917
100.....	<0.10	Jaeger, 1923
150.....	0.2	Jaeger, 1923
200.....	0.7	»
350.....	2.8	»
300.....	13.0	»

The determination of Führer was made by adding the toluene from a buret to a measured volume of water untill saturation was reached. The determinations of Jaeger were made in a large shaking autoclave of more than two liters capacity. A measured volume of the saturated solution was cooled and after it had separated into two layers the volume of toluene was measured.

100 gms. sat. solution of toluene in 92 wt. per cent ethyl alcohol contain 88.0 gms. $C_6H_5CH_3$ at 15°. (Ormandy and Craven, 1921.)

Freezing-point data are given by Dessart, 1926, for mixtures of toluene and *m* nitrotoluene, and for toluene and *m* toluidine. Results for mixtures of toluene and *m* xylene are given by Nakatsuchi, 1926.

Chloro **TOLUENES** $C_6H_4CH_3Cl$, ortho and para.

Freezing-point data for mixtures of ortho and para chlorotoluene are given by Wahl, Normand and Vermeylen, 1922.

Nitro **TOLUENES**.

SOLUBILITY OF TRINITRO TOLUENE IN CONCENTRATED SOLUTIONS OF SULFURIC ACID (Hough, Savage and Van Marle, 1920.)

Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms. sat. solution in

t°.	70 % H_2SO_4.	75 % H_2SO_4.	80 % H_2SO_4.	85 % H_2SO_4.	90 % H_2SO_4.	95 % H_2SO_4.	100 % H_2SO_4
0....	–	0.3	0.4	0.6	2.0	3.5	13.0
10....	–	0.3	0.45	0.75	2.2	4.0	13.5
20....		0.3	0.5	0.85	2.5	4.8	15.0
25....		0.32	0.55	0.95	2.6	5.2	15.5
30....		0.35	0.6	1.0	2.7	6.0	16.5
40....	0.2	0.4	0.65	1.3	3.0	7.0	18.0
50....	0.2	0.45	0.70	1.7	3.5	8.5	21.0
60....	0.22	0 5	1.0	2.3	5.2	11.0	24.8
70....	0.35	0.7	1.6	3.3	7.0	13.5	29.0
80....	0.6	1.3	2.4	4.8	10.0	18.0	36.5

The above approximate values were read from the authors chart.

Solubility of α or 2, 4, 6 Trinitro Toluene (TNT) in Water.

(Taylor and Rinkenbach, 1923; also quoted in full by Desvergnes, 1924.)

Commercial Grade I trinitrotoluene was purified by recrystallization from hot benzene and from hot 95 % alcohol. Its setting point was 80°.6. The saturated solutions were prepared in triplicate by shaking frequently, during several hours, mixtures which had been heated to a temperature higher than that of the determination and afterwards kept in a thermostat. In some cases equilibrium was approached from below instead of above. About 30 to 50 grams of the saturated solution were weighed in a wagon pipet, the solvent evaporated by means of a current of warm dry air and the residue weighed after drying to constant weight. The determinations were plotted and the results for regular intervals of temperature were read from the curve.

t°.	Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms. H_2O.	t°.	Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms. H_2O.	t°.	Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms. H_2O.	t°.	Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms. H_2O.
0....	0.0100	30....	0.0175	55....	0.0570	80....	0.1075
10....	0.0110	35....	0.0225	60....	0.0675	85....	0.1175
15....	0.0120	40....	0.0285	65....	0.0775	90....	0.1275
20....	0.0130	45....	0.0360	70....	0.0875	95....	0.1375
25....	0.0150	50....	0.0475	75....	0.0975	100....	0.1475

Solubility of α or 2, 4, 6 Trinitro Toluene (TNT) in Aniline.

(Taylor and Rinkenbach, 1923; also quoted by Desvergnes, 1924.)

A large number of approximate determinations were made by the cooling curve method and four accurate determinations were made by the crystal growth method. These latter were used as fixed points for correcting the approximate curve. In the following table the results, showing grams per 100 grams sat. solution, were read from the authors diagram and the results showing grams per 100 grams of aniline were taken from his corrected table.

t°.	Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms. sat. sol.	Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms. $C_6H_5NH_2$.	Solid Phase.
−6.0..	0.0	0.0	$C_6H_5NH_2$
0...	5.0	5.0	$C_6H_5NH_2.C_6H_2CH_3(NO_2)_3$
10...	6.0	6.1	»
20...	8.0	8.1	»
25...	9.0	9.4	»
30...	10.0	11.4	»
40...	15.0	18.0	»
50...	22.0	28.7	»
60...	30.0	44.5	»
70...	42.0	69.3	»

t°.	Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms. sat. sol.	Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms. $C_6H_5NH_2$.	Solid Phase.
75.....	48.0	92.3	$C_6H_5NH_2.C_6H_2CH_3(NO_2)_3$
80.....	56.0	130	»
83.6m. pt..	68.0	–	»
80.....	80.0	–	»
75.....	86.0	595	»
70.....	89.0	807	»
68 tr. pt..	90.0	–	»+$C_6H_2CH_3(NO_2)_3$
70.....	91.0	1043	$C_6H_2CH_3(NO_2)_3$
75.....	96.0	2074	»
80.6....	100.0	∞	»

Solubility of α or 2, 4, 6 Trinitro Toluene (TNT) in Pyridine.

(Taylor and Rinkenbach, 1923; also quoted by Desvergnes, 1924.)

As in the case of the solubility in aniline, a complex is formed with pyridine. It was found to have the composition $C_5H_5N.C_6H_2CH_3(NO_2)_3$ and m. pt. 40°-42°. The determinations were made in the same manner as described above. The approximate results obtained by the cooling curve method were corrected by means of accurate determinations of the saturation points of prepared mixtures. The authors' corrected values are as follows.

t°.	Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms. C_5H_5N.	t°.	Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms. C_5H_5N.	t°.	Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms. C_5H_5N.
20.....	137	40.....	255	60.....	600
25.....	158	45.....	302	65.....	833
30.....	184	50.....	370	70.....	1250
35.....	215	55.....	462	75.....	2460

Solubility of α or 2, 4, 6 Trinitro Toluene (TNT) in Several Solvents
(Taylor and Rinkenbach, 1923; also quoted by Desvergnes, 1924.)

The determinations were made as described on the previous page. The alcohol was 95.07 vol. % and $d_{15} = 0.816$. The results were plotted and the following values read from the curves.

Gms. $C_6H_2CH_3(NO_2)_3$ per 100 gms. of each solvent.

t°.	Acetone.	Benzene.	95% C_2H_5OH.	CCl_4.	CS_2.	$CHCl_3$.	$(C_2H_5)_2O$.	Toluene.
0.....	57	13	0.65	0.20	0.14	6	1.73	28
5.....	66	24	0.75	0.25	0.20	8.5	2.08	32
10.....	78	36	0.85	0.40	0.26	11	2.45	38
15.....	92	50	1.07	0.50	0.35	15	2.85	45
20.....	109	67	1.23	0.65	0.48	19	3.29	55
25.....	132	88	1.48	0.82	0.63	25	3.80	67
30.....	156	113	1.80	1.01	0.85	32.5	4.56	84
35.....	187	144	2.27	1.32	1.13	45	–	104
40.....	228	180	2.92	1.75	1.53	66	–	130
45.....	279	225	3.70	2.37	2.02	101	–	163
50.....	346	284	4.61	3.23	–	150	–	208
55.....	449	361	6.08	4.55	–	218	–	272
60.....	600	478	8.30	6.90	–	302	–	367
65.....	843	665	11.40	11.40	–	442	–	525
70.....	1350	1024	15.15	17.34	–	–	–	826
75.....	2678	2028	19.50	24.35	–	–	–	1685

100 gms. glycol diacetate (CH_3 CO O CH_2.CH_2 O OC.CH_3, b. pt. 188°-189°.6) dissolve 44.4 gms. C_6 H_2 CH_3 $(NO_2)_3$ at 25°. (Taylor and Rinkenbach, 1926.)

Freezing-point lowering data (solubilities, see foot-note, p. 1001) are given for the following systems.

o Nitro Toluene + *m* Nitro Toluene (Bell and Mc Ewen, 1922.)
» » » + *p* » » (Bell, Cordon, Spry and White, 1921.)
» » » + » » » (Gibson, Duckham and Fairbairn, 1922.)
m » » + » » » » » » »
» » » + » » » (Bell and Mc Ewen, 1922.)
o » » + 1.2.4 Dinitro » (Bell, Cordon, Spry and White, 1921.)
» » » + 1.2.4.6 Trinitro » » » » » »
» » » + *p* Nitro Toluene + 1.2.4 Dinitro Toluene (Bell and Cordon, 1912.
» » » + » » » + 1.2.4.6 Trinitro Toluene » » »
p » » + 1.2.4.6 Trinitro Toluene (Bell and Herty, Jr. 1919.)
» » » + 1.2.4 Dinitro Toluene » » »
» » » + » » » + 1.2.4.6 Trinitro Toluene (Bell and Herty, Jr. 1919.
» » » + Trinitro *m* Xylene (Bell and Sawyer, 1919.)
1.2.4 Dinitro Toluene + 1.2.6 Dinitro Toluene (Gibson, Duckham and Fairbairn, 1922.)
» » » + 1.2.4.6 Trinitro » (Bell and Herty, Jr. 1919; Wogrniz and Vari, 1919; Giua, 1920.)
» » » + Urea (Kremann and Petritschek, 1917; Rheinboldt and Kirscheisen, 1926.
» » » + *p* Toluidine (Kremann and Petritschek, 1917.)
» » » + Trinitro *m* Xylene (Bell and Sawyer, 1919.)
1.2.3 » » + 1.2.5 Dinitro Toluene (Gibson, Duckham and Fairbairn, 1922.)
» » » + 1.3.4 » » » » » » »
1.2.5 » » + » » » » » » »
1.2.6 » » + *p* Toluidine (Kremann, Hönigsberg and Mauermann, 1923.)
1.3.4 » » + » » » » » » »
1.3.5 » » + » » » » » » »
1.2.4.6 Trinitro Toluene + Trinitro *m* Xylene (Bell and Sawyer, 1919.)
2 Brom, 4 Nitro Toluene + 3 Brom 4 Nitro Toluene (Coffey, 1926.)
o Toluene Sulfamine + *p* Toluene Sulfamine (Dobrjansky, 1920; Mc Kie, 1918.)
o » Sulfonyl Chloride + *p* Toluene Sulfonyl Chloride (Harding, 1921.)
2 Chloro 5 Nitro *p* Toluene Sulfonyl Chloride + 2 Chloro 6 Nitro *p* Toluene Sulfonyl Chloride (Davies, 1921.)

Hydroxy TOLUIC ACIDS

$C_6H_3COOH.OH.CH_3$, 1,2,3; 1,2,4; 1,2,5; 1,3,4 and 1,4,3.

Solubility of Each Separately in Water. (Sidgwick and Ewbank, 1921 *a*.)

The determinations were made by the synthetic method and all details for accurate work were carefully observed. The results are expressed in wt. % that is, in grams of acid per 100 grams of saturated solution. L indicates that a second liquid layer separated. The position of the substituent groups in the several acids are numbered in the order, CO OH, OH and CH_3. Thus the 1, 2, 3 acid is C_6H_3.(1) CO OH.(2) OH.(3) CH_3, the 1.2.4 acid is C_6H_3.(1) CO OH.(2).OH (4) CH_3, the 1, 2, 5 acid is C_6H_3.(1) CO OH.(2) OH.(5) CH_3, the 1, 3, 4 acid is C_6H_3.(1) CO OH .(3) OH.(4) CH_3 and the 1, 4, 3 acid is C_6H_3.(1) CO OH.(4) OH.(3) CH_3.

Results for the 1, 2, 3 Acid.

t°.	Wt. %.
167.0...	100.00
147.5...	90.07
134.5...	80.50
134.1...	79.68
129.8...	69.52
120.3...	– L
148.0...	59.73 L
151.3...	50.51 L
153.5 cr.	– L
153.3...	29.81 L
149.3...	10.18 L
131.8...	5.07 L
129.2 tr.	–
119.1...	2.20
80.7...	0.364

Results for the 1, 2, 4 Acid.

t°.	Wt. %.
177.8...	100.00
147.8...	89.68
138.3...	79.68
132.6...	67.68
139.4...	54.40 L
144.6...	41.46 L
145.2 Cr.	– L
144.6...	19.89 L
138.4...	9.75 L
131.0 tr.	–
129.4...	5.53
125.3...	– L
80.7...	0.412

Results for the 1, 2, 5 Acid.

t°.	Wt. %.
152.5...	100.00
126.4...	89.71
112.0...	79.66
109.5...	77.05
117.7...	69.29 L
120.2...	67.91 L
131.5...	59.85 L
135.6...	55.16 L
142.0...	38.85 L
142.8 Cr.	– L
142.5...	24.55 L
138.5...	10.21 L
117.5...	4.53 L
107.8 tr.	–
85.0...	0.92
80.7...	0.73

Results for the 1, 3, 4 Acid.

t°.	Wt. %.
208.5...	100.00
154.0...	76.98
143.0...	66.07
131.4...	48.67
124.2...	30.23
113.1...	10.33
98.8...	4.03

Results for the 1, 4, 3 Acid.

t°.	Wt. %.
172.4...	100.00
146.8...	84.12
132.4...	65.52
124.1...	47.57
118.8...	30.87
109.0...	9.61
105.8...	6.52
103.4...	5.77
99.5 t.h.	5.01
96.6...	3.70
92.6...	2.77
84.4...	1.83

Cr. = Critical Solution Temp.
tr. = Triple point.
t. h. = Transition point of hydrate.

Solubility of Hydroxy Toluic Acids in Benzene. (Sidgwick and Ewbank, 1921 *a*.)

1, 2, 3 Acid.		1, 2, 4 Acid.		1, 2, 5 Acid.		1, 3, 4 Acid.		1, 4, 3 Acid.	
t°.	Wt. %.	t°.	Wt. %.	t°.	Wt. %.	t°.	Wt. %.	t°.	Wt. %.
155.4...	90.33	167.6...	91.6	142.0...	91.10	202.5...	91.7	166.0...	90.7
138.3...	69.92	150.3...	71.7	124.7...	70.36	192.0...	72.7	152.8...	71.7
123.0...	49.18	135.1...	50.7	110.6...	52.05	183.7...	50.0	145.0...	52.6
107.2...	29.96	117.6...	29.33	93.3...	29.98	176.5...	29.8	139.5...	29.8
79.1...	9.67	90.2...	9.74	68.0...	10.53	160.5...	9.8	126.2...	10.11
62.4...	5.23	71.7...	4.96	48.8...	4.73	147.4...	4.87	116.7...	4.78
45.2...	2.01	48.8...	2.02	30.0...	1.76	131.6...	2.18	109.5...	2.78

Solubility of Hydroxy Toluic Acids in *n* Heptane. (Sidgwick and Ewbank, 1921 *a*.)

1, 2, 3 Acid.		1, 2, 4 Acid.		1, 2, 5 Acid.		1, 3, 4 Acid.		1, 4, 3 Acid.	
t°.	Wt. %.	t°.	Wt. %.	t°.	Wt. %.	t°.	Wt. %.	t°.	Wt. %.
154.3...	88.95	166.7...	79.29	145.9...	189.9	180.0...	0.94	163.8...	1.40
146.6...	70.04	162.2...	61.03	138.7...	69.9			156.0...	1.40L
141.9...	52.03	156.6...	36.28	135.5...	50.0			157.3...	1.02
140.9...	47.63	147.1...	20.15	131.1...	30.38			135.0...	1.02L
132.9...	24.77	135.6...	10.00	116.2...	10.42	202.0 tr.		168.0 tr.	
119.0...	9.95	116.7...	4.51	97.1...	4.59				
101.0...	4.86	100.6...	2.22	79.0...	1.84				
81.0...	1.89								

Solubility of Ortho, Meta and Para Toluic Acids ($C_6H_4.CH_3.CO\,OH$), Each Separately, in Ortho, Meta and Para Xylene, at 14°.

(Chapas, 1922.)

Each solvent was saturated with the given acid at the temperature of the water bath and the mixture allowed to cool to room temperature, while being agitated from time to time. The dissolved acid was determined by agitating a weighed amount of the saturated solution with an excess of 0.1 *n* Na OH and titrating with 0.1 *n* H Cl, using phenolphthalein as indicator.

Compound.	Formula.	Gms. compound dissolved per 100 gms. *o* Xylene.	*m* Xylene.	*p* Xylene.
Ortho toluic acid.....	$C_6H_4.CH_3.COOH$ (*o*)	7.11	5.78	7.39
Meta »	» (*m*)	8.63	8.57	10.32
Para »	» (*p*)	1.05	0.91	1.47

TOLUIDINES $C_6H_4.CH_3.NH_2$, *o*, *m* and *p*.

Reciprocal Solubility of Ortho Toluidine and Water.

(Angelesco, 1925.)

The temperatures of clouding of mixtures of weighed amounts of the two constituents, contained in sealed tubes, were carefully determined.

t°.	Gms. $C_6H_4CH_3.NH_2$ (*o*) per 100 gms. Aqueous layer.	Toluidine layer.	t°.	Gms. $C_6H_4CH_3.NH_2$ (*o*) per 100 gms. Aqueous layer.	Toluidine layer.
0.....	1.68	97.65	198.....	16.47	–
20.....	1.69	97.50	200.....	–	79.77
122.....	–	93.13	207.....	–	74.70
150.....	5.65	–	212.....	–	66.80
163.....	–	88.46	215.....	–	56.08
181.....	–	85.33	216 crit. t.	50.09	
185.....	12.46	–			

Solubility of Ortho Toluidine in Aqueous Solutions of Acetic Acid.

(Angelesco, 1925.)

The determinations were made by adding ortho toluidine drop by drop to water or aqueous acetic acid just to the appearance of clouding at a definite temperature. The quantities of the three constituents were determined by careful weighings.

Results at 0°.

Gms. per 100 gms. sat. sol. $C_6H_4CH_3NH_2$ (*o*).	CH_3COOH.	Gms. per 100 gms. sat. sol. $C_6H_4CH_3NH_2$ (*o*).	CH_3COOH.
1.68	0.00	38.54	19.42
2.36	0.56	41.26	19.48
4.16	2.05	45.58	19.46
5.13	3.51	50.99	19.33
6.15	5.37	57.44	18.71
7.41	7.10	64.74	17.31
9.09	9.76	70.54	15.56
11.23	12.50	75.19	13.80
13.63	14.54	80.74	11.28
17.79	16.72	85.06	8.85
22.02	17.94	89.27	6.22
27.29	18.79	94.21	2.75
32.13	19.17	97.65	0.00
35.29	19.32		

Results at 20°.

Gms. per 100 gms. sat. sol. $C_6H_4CH_3NH_2$ (*o*).	CH_3COOH.	Gms. per 100 gms. sat. sol. $C_6H_4CH_3NH_2$ (*o*).	CH_3COOH.
1.69	0.00	23.21	20.51
2.79	1.19	27.67	21.13
3.72	2.47	31.19	21.36
4.37	3.63	34.33	21.77
5.14	5.17	38.22	21.44
5.86	6.50	39.89	21.41
6.84	8.25	46.93	21.27
7.66	9.86	50.12	21.03
8.60	11.34	57.59	19.99
9.49	12.75	65.51	18.00
10.35	14.02	73.92	14.79
11.62	15.26	82.11	10.57
12.81	16.33	89.36	6.03
15.02	17.80	93.55	2.96
17.66	18.97	97.50	0.00
20.33	19.85		

Distribution of Acetic Acid at 20° Between Water and Ortho Toluidine.

(Angelesco, 1925.)

In connection with the results showing the solubility of ortho toluidine in aqueous solutions of acetic acid, a series of determinations of the distribution of acetic acid between water and toluidine was needed in order to ascertain the composition of those solutions in contact with each other at a given temperature. The results which were obtained are as follows.

Gms. CH_3COOH per 100 gms.		$\frac{C_1}{C_2}$.	Gms. CH_3COOH per 100 gms.		$\frac{C_1}{C_2}$.
H_2O layer (C_1).	Toluidine layer (C_2).		H_2O layer (C_1).	Toluidine layer (C_2).	
1.45	0.71	2.04	13.94	11.05	1.26
2.87	1.55	1.85	15.49	12.62	1.23
3.77	2.14	1.76	16.39	13.78	1.18
7.22	4.65	1.55	17.64	15.71	1.12
7.97	5.19	1.53	18.87	17.18	1.09
11.37	8.12	1.40	19.41	18.06	1.07

Angelesco, 1925, next determined the temperatures at which two layers are formed in solutions containing constant concentrations of acetic acid and variable percentages of water and ortho toluidine. For this purpose mixtures of toluidine and acetic acid and of water and acetic acid, containing in both cases the same weight per cent of acetic acid, were prepared. Variable mixtures of these two solutions yield in every case a ternary mixture containing a constant percentage of acetic acid. On gradually changing the temperature of such ternary mixtures, containing respectively 19.94, 21.84, 23.33 and 23.60 per cent of $CH_3CO\,OH$, an upper and a lower point was found at which clouding occurs. Thus for these ranges of concentration, the systems yield closed curves of solubility having an upper and a lower critical temperature of solution. The following results were obtained.

Variation of the Temperature of Solution in a Ternary Mixture of Ortho Toluidine containing 19.94 per cent of Acetic Acid.

Gms. $C_6H_4CH_3NH_2$ per 100 gms. sat. sol.	Lower temp.	Upper temp.	Gms. $C_6H_4CH_3NH_2$ per 100 gms. sat. sol.	Lower temp.	Upper temp.	Gms. $C_6H_4CH_3NH_2$ per 100 gms. sat. sol.	Lower temp.	Upper temp.
59.09	22.5	72.0	34.65	5.6	not. det.	19.38	22.4	not. det.
57.84	17.8	78.6	33.10	6.2	»	18.86	24.0	»
56.54	14.5	84.2	31.78	6.6	»	18.41	25.6	»
52.27	12.5	90.4	30.47	7.3	»	17.89	27.5	»
54.05	10.4	not. det.	29.35	7.9	»	17.45	29.5	»
53.13	8.8	»	28.23	8.7	»	17.00	31.8	»
52.09	7.6	»	27.23	9.5	»	16.62	33.6	»
50.67	6.7	»	26.26	10.4	»	16.24	35.5	»
49.43	6.0	»	25.39	11.4	»	15.85	37.4	»
47.74	5.2	»	24.20	12.9	»	15.40	41.2	»
46.12	4.9	»	23.47	13.8	»	15.05	43.5	»
44.53	4.6	»	22.78	15.0	»	14.72	47.0	»
42.93	4.6	»	22.08	16.3	»	14.36	51.0	90.0
41.29	4.6	»	21.43	17.5	»	14.17	54.0	86.5
39.69	4.6	»	20.63	19.2	»	13.97	63.0	80.5
37.98	4.8	»	20.20	20.1	»	13.68	68.0	76.0
36.23	5.1	»	19.75	21.5	»			

VARIATION OF THE TEMPERATURE OF SOLUTION IN TERNARY ORTHO TOLUIDINE MIXTURES CONTAINING 21.84 PER CENT OF ACETIC ACID.

(Angelesco, 1925, Con.)

Gms. $C_6H_4CH_3NH_2$ per 100 gms. sat. sol.	Lower temp.	Upper temp.	Gms. $C_6H_4CH_3NH_2$ per 100 gms. sat. sol.	Lower temp.	Upper temp.	Gms. $C_6H_4CH_3NH_2$ per 100 gms. sat. sol.	Lower temp.	Upper temp.
52.57	48.2	56.0	36.43	23.3	not. det.	21.21	37.0	not. det.
51.55	39.0	67.5	34.79	23.3	»	20.48	39.0	»
50.71	35.5	73.5	32.74	23.5	»	19.80	41.6	»
49.83	33.0	77.5	30.58	24.2	»	19.07	45.5	»
49.02	31.0	81.0	29.00	25.1	»	18.54	48.5	»
48.20	29.0	83.5	27.60	26.2	»	18.06	51.4	89.7
47.34	28.4	86.0	26.15	27.5	»	17.76	55.0	86.5
46.27	27.4	89.0	24.88	29.3	»	17.61	57.0	84.5
44.25	25.6	not. det.	23.76	31.1	»	17.44	59.5	82.0
42.40	24.6	»	22.84	32.8	»	17.24	63.0	78.5
39.99	24.0	»	21.99	34.7	»	17.06	67.0	74.0
38.23	23.5	»						

VARIATION IN THE TEMPERATURE OF SOLUTION IN TERNARY ORTHO TOLUIDINE MIXTURES CONTAINING : (Angelesco, 1925, Con.)

23.33 per cent CH_3COOH.

Gms. $C_6H_4CH_3NH_2$ per 100 gms. sat. sol.	Lower temp.	Upper temp.
39.15	52.5	71.0
38.26	51.2	75.5
37.15	49.6	78.5
36.12	48.2	81.0
34.95	47.2	83.0
33.73	46.3	85.8
32.02	45.7	87.8
30.66	45.6	88.5
29.47	46.0	89.3
28.22	47.6	89.5
26.82	49.0	88.8
25.25	52.2	87.2
23.95	56.0	84.5
22.83	61.7	78.5
22.32	69.0	74.0

23.6 per cent CH_3COOH.

Gms. $C_6H_4CH_3NH_2$ per 100 gms. sa.. sol.	Lower temp.	Upper temp.
37.45	57.5	69.0
36.80	55.0	75.5
36.11	53.5	76.0
35.28	51.0	78.5
34.28	50.5	80.5
33.34	50.0	82.5
32.27	49.5	84.5
30.68	49.0	85.5
29.69	49.5	86.0
28.86	50.5	85.8
27.86	51.2	85.5
26.60	53.4	84.8
25.73	55.0	83.7
25.01	57.0	82.0
24.63	58.5	80.7
24.23	61.0	79.0
23.83	64.0	77.0

With a concentration of acetic acid of 24.52 per cent, these is no longer formation of two liquid phases at any temperature.

SOLUBILITY OF PARA TOLUIDINE IN ETHYL ALCOHOL.

(Speyers, 1902 ; See Note, p. 1001.)

t°.	Wt. of 1 cc. sat. sol.	Mols. $C_6H_5CH_3NH_2$ (*p*) per 100 mols. sat. sol.	Gms. $C_6H_4CH_3NH_2$ (*p*) per 100 gms. C_2H_5OH.
0.....	0.8885	20.72	60.8
5.....	0.8982	26.0	82.0
10.....	0.9080	32.0	107.0
15.....	0.9180	38.6	145.0
20.....	0.9265	47.0	206.0
25.....	0.9360	56.0	340.0

100 gms. abs. alcohol dissolve 110.0 gms. *p*-toluidine at 20-25°.

(Pucher and Dehn, 1921.)

CRITICAL SOLUTION TEMPERATURES OF TOLUIDINES IN SEVERAL SOLVENTS.
(Thiry, 1925.)

Solvent*.	Ortho Toluidine. Crit. sol. temp.	Ortho Toluidine. % $C_6H_4CH_3.NH_2(o)$ at C. s. t.	Meta Toluidine. Crit. sol. temp.	Meta Toluidine. % $C_6H_4CH_3.NH_2(m)$ at C. s. t.	Para Toluidine. Crit. sol. temp.	Para Toluidine. % $C_6H_4CH_3.NH_2(p)$ at C. s. t.
Methyl Cyclopentane..	−10.9	27.5	–	–	–	–
Ethyl » ..	— 8.3	40.0	–	–	–	–
Methyl Cyclohexane...	— 6.6	44.0	— 8.3	38.2	–	–
Hexane.....	+21.1	36.0	+21.3	47.7	–	–
Methyl 3 Pentane.....	–	–	–	–	+32.4	30.0
Isohexane.....	+25.5	42.5	–	–	+36.0	20.0

* For the constants of the solvents see last Table, p. 1058.

Freezing-point data for mixtures of 2,6 and 4,6 dibrom meta toluidines are given by Olivier, 1924. Results for mixtures of 6 chloro, 4 nitro meta toluidine and 6 chloro, 3 nitro para toluidine are given by Morgan and Challenor, 1921.

TOLUIDINE HELIANTHATES *o* and *m* $C_7H_9N.C_{14}H_{15}N_3SO_3$.

1000 cc. water dissolve 0.270 gm. *o* Toluidine Helianthate at 20-25°.
» » 0.162 » *m* » »
(Stark and Dehn, 1918.)

TRIPHENYL TRIAZINE, etc.

Freezing-point data for mixtures of triphenyl triazine and methyl diphenyl triazine and for triphenyl triazine and triazine tricarboxylate of ethyl are given by Pascal, 1925.

TRIPHENYL AMINE $(C_6H_5)_3N$.

100 gms. 96 % ethyl alcohol dissolve 0.74 gm. $(C_6H_5)_3N$ at 19°-20°. 5 and 5.5 gms. at 74°.

100 gms. 98.5 % methyl alcohol ($d_{\frac{15}{4}} = 0.7998$) dissolve 0.73 gm. $(C_6H_5)_3N$ at 19°-20°. 5 and 3.3 gms. at 74°. (Boldyrev, 1916.)

TRIONAL $C_2H_5(CH_3)C(SO_2.C_2H_5)_2$.

10 cc. of horse serum dissolve 0.0102 gm. trional at 20°. The distribution between horse serum in contact with olive oil was found to be 0.0080 gm. trional per 10 cc. of serum layer and 0.0022 gm. per 10 cc. of olive oil layer at 20°. (Aiello, 1921.)

***l* TRYPTOPHAN** $C_8H_6N.CH_2.CH(NH_2)COOH$.

SOLUBILITY OF TRYPTOPHAN IN WATER AND IN AQUEOUS SALT SOLUTIONS AT 22-23°.
(Pfeiffer and Angern, 1924.)

The determinations were made by the method described under Alanine, p. 1019.

Solvent.	Gms. $C_{11}H_{12}N_2O_2$ per 100 cc. sat. sol.
Water.....	1.306
Aq. 0.2 molecular CH_3COOK.....	1.202
» $(NH_4)_2SO_4$.....	0.588
» NaCl.....	1.080

***l* TYROSINE** (*p* Hydroxy phenyl alanine) $C_6H_4OH.CH_2.CH(NH_2)COOH$.

SOLUBILITY OF *l* TYROSINE IN WATER AND IN AQUEOUS SALT SOLUTIONS.

The solutions were saturated by agitating a large excess of tyrosine with the solvent in a thermostat. The dissolved tyrosine was calculated from a micro nitrogen determination.

Solvent.	t°.	Mols. $C_9H_{11}NO_3$ per liter.	Gms. $C_9H_{11}NO_3$ per liter.	Authority.
Water.....	20.5	0.00246	0.446	(von Euler and Rudberg, 1924-1925.)
»	21.0	0.00250	0.452	(von Euler and Angern, 1924.)
Aq. 0.10*n* $LiNO_3$..	20.5	0.00086	0.155	(von Euler and Rudberg, 1924-1925.)
» 0.25*n* » ..	20.5	0.000071	0.0129	»
» 0.05*n* NaCl..	20.5	0.00245	0.444	»
» 0.10*n* » ..	20.5	0.00239	0.433	»
» 0.25*n* » ..	20.5	0.00214	0.388	»

SIMULTANEOUS SOLUBILITY OF *l* TYROSIN AND *dl* LEUCINE IN WATER AND IN AQUEOUS 0.01 NORMAL HYDROCHLORIC ACID AT 21°. (von Euler and Rudberg, 1924.)

Saturation was obtained by constant agitation of a large excess of the amino acids with the solvents in a thermostat. The saturated solutions were analyzed by a determination of total nitrogen and a colorimetric estimation of the tyrosin, by means of the xanthoprotein reaction in alkaline solution.

Solvent.	Gms. per liter of sat. sol. *l* Tyrosine.	*dl* Leucine.	Solid Phase.
Water	0.338	9.87	*l* Tyrosine + *dl* Leucine
Aq. 0.01 *n* HCl (p_H = 1.74)	0.782	12.544	» »

The sat. solution in 0.01 *n* HCl had p_H = 2.93.

SOLUBILITY OF TYROSINE IN AQUEOUS SOLUTIONS OF DIFFERENT HYDROGEN ION CONCENTRATION AT 25°. (Sano, 1926.)

The desired p_H concentration was secured with such acids and bases as form easily soluble salts with tyrosine. The solid phase in all cases was the amino acid. A large excess of tyrosine was shaken in a thermostat with the solvent and the saturated solution was analyzed by determination of the p_H with a hydrogen electrode, and the nitrogen by the micro Kjeldahl method, using iodometric titration according to Bang.

Solvent.	p_H of sat. sol.	Gms. N per liter sat. sol.	Solvent.	p_H of sat. sol.	Gms. N per liter sat. sol.
0.1 *n* HCl + 0.9 *n* KCl	1.07	0.41400	0.32 mol. sec. phosphate + 0.0025 mol. prim. phosphate	7.41	0.04160
0.1 *n* »	1.17	0.34070	0.066 mol. sec. phosphate	8.39	0.04532
0.02 *n* »	1.74	0.12460	0.005 *n* NaOH	9.04	0.07022
0.01 *n* »	2.25	0.07008	0.01 *n* »	9.51	0.12070
1.0 *n* CH_3COOH	2.39	0.06056	0.02 *n* » + 0.9 *n* KCl	9.63	0.15110
0.1 *n* »	3.02	0.04131	0.05 *n* NaOH	10.07	0.44260
0.016 *n* » + 0.1 *n* CH_3COONa	5.56	0.03658	0.10 *n* »	10.25	0.83900
» + 0.1 *n* CH_3COONa + 0.9 *n* KCl	5.60	0.03554	0.33 *n* »	10.55	0.24520

The solubility minimum is at 0.03658 gm. N or 0.4726 gm. tyrosine per liter.

URANIUM HELIANTHATE $(C_{14}H_{14}N_3SO_3)_2U.4H_2O$.

1000 cc. H_2O dissolve 0.30 gm. hydrated uranium helianthate at 20-25°. (Stark and Dehn, 1918.)

URANYL NITRATE $UO_2(NO_3)_2.6H_2O$.

EQUILIBRIUM IN THE SYSTEM URANYL NITRATE, NITRIC ACID AND WATER AT 25°. (Colani, 1926.)

Gms. per 100 gms. sat. sol. Free HNO_3.	$UO_2(NO_3)_2$.	Solid Phase.	Gms. per 100 gms. sat. sol. Free HNO_3.	$UO_2(NO_3)_2$.	Solid Phase.
0.0	56.08	$UO_2(NO_3)_2.6H_2O$	46.12	27.18	$UO_2(NO_3)_2.3H_2O$
12.35	40.36	»	50.43	25.79	»
25.14	30.29	»	53.20	26.77	»
28.67	29.65	»	53.71	27.49	»
29.84	31.27	»	55.24	27.24	$UO_2(NO_3)_2.2H_2O$
30.43	36.72	»	60.38	23.65	»
30.15	37.99	»	66.71	22.29	»
32.31	36.28	$UO_2(NO_3)_2.3H_2O$	68.83	22.49	»

SOLUBILITY OF URANYL NITRATE HEXAHYDRATE IN AQUEOUS NITRIC ACID AT 20°. (Nichols, Howes, et. al. 1919.)

Per cent concentration of aq. HNO_3	10.0	20.0	30.0	40.0	70.0
Gms. $UO_2(NO_3)_2.6H_2O$ per 100 gms. solvent	160.0	115.0	80.0	65.0	65.0

URANYL Potassium NITRATES $UO_2(NO_3)_2.KNO_3$, $UO_2(NO_3)_2.2\,KNO_3$.

SOLUBILITY OF URANYL POTASSIUM NITRATES IN AQUEOUS NITRIC ACID AT 20°.
(Nichols, Howes et. al., 1919.)

Results for $UO_2.(NO_3)_2.KNO_3$			Results for $UO_2(NO_3)_2.2\,KNO_3$		
Per cent HNO_3 in solvent.	Gms. $UO_2.(NO_3)_2.KNO_3$ per 100 gms solvent.	Solid Phase.	Per cent HNO_3 in solvent.	Gms. $UO_2(NO_3)_2.2\,KNO_3$ per 100 gms. solvent.	Solid Phase.
0.0	85.5	KNO_3	0.0	62.9	KNO_3
10.0	82.0	»	10.0	52.2	»
20.0	99.8	»	20.0	45.7	»
30.0	89 0	$UO_2(NO_3)_2.6\,H_2O$	30.0	51.8	»
30.0	89.5	$UO_2(NO_3)_2.KNO_3$	40.0	67.2	»
40.0	81.0	»	50.0	52.3	$UO_2(NO_3)_2.2\,KNO_3$
50.0	54.0	»	50.0	57.2	$UO_2(NO_3)_2.KNO_3$
60.0	33.9	»			

URANYL OXALATE $UO_2.C_2O_4.3\,H_2O$.

SOLUBILITY OF URANYL OXALATE IN WATER. (Colani, 1925.)

t°	11.0	15.0	20.0	50.0	75.0	100.0
Gms. $UO_2C_2O_4$ per 100 gms. sat. sol..	0.45	0.47	0.50	1.00	1.65	3.06

The solid phase was $UO_2.C_2\,H_4.3\,H_2\,O$ in all cases.

SOLUBILITY OF URANYL OXALATE IN AQUEOUS SOLUTIONS OF ACIDS.
(Colani, 1925.)

In Aq. HCl at 11°

Gms. per 100 gms. sat. sol.		Solid Phase.
HCl.	$UO_2C_2O_4$.	
3.60	1.14	$UO_2.C_2O_4.3\,H_2O$
8.20	2.00	»
11.49	2.91	»
14.99	4.90	»
17.65	8.82	»

In Aqueous Oxalic Acid at 15°

Gms. per 100 gms. sat. sol.		Solid Phase.
$H_2C_2O_4$.	$UO_2C_2O_4$.	
1.40	1.56	$UO_2.C_2O_4.3\,H_2O$
2.66	1.86	»
4.12	2.02	»
5.18	2.09	»
7.33	2.19	»
7.49	1.55	$H_2C_2O_4.2H_2O$
7.55	1.20	»
7.56	0.78	»
7.48	0.39	»
7.46	0.00	»

In Aq. Nitric Acid at 20°.

Gms. per 100 gms. sat. sol.	
HNO_3.	$UO_2C_2O_4$.
1.84	0.79
5.34	1.19
12.14	1.56
17.60	1.76
21.47	1.88
31.00	2.28

In Aq. Phosphoric Acid at 20°.

Gms. per 100 gms. sat. sol.	
H_3PO_4.	$UO_2C_2O_4$.
0.77	2.10
1.51	3.56
2.67	5.66
4.94	9.25
8.75	15.14
15.76	25.74

In Aq. Sulfuric Acid at 20°.

Gms. per 100 gms. sat. sol.		Gms. per 100 gms. sat. sol.	
H_2SO_4.	$UO_2C_2O_4$.	H_2SO_4.	$UO_2C_2O_4$.
0.00	0.50	15.07	3.85
0.82	0.85	19.88	4.93
2.59	1.34	25.58	5.98
3.05	1.61	27.31	6.46
5.53	2.04	29.67	7.49

URANIUM SULFATE (ous) $U(SO_4)_2$.

SOLUBILITY OF URANIUM SULFATE IN 0.1 NORMAL SULFURIC ACID SOLUTIONS.
(Meyer and Nachod, 1924.)

Tenth normal sulfuric acid was used as solvent instead of water to prevent hydrolysis to $UO\,SO_4.2\,H_2\,O$. The saturated solutions were prepared by constant agitation for 12 hours of 3-5 gms. of each hydrate with 10-12 cc. of 0.1 *n* acid.

t°.	Gms. $U(SO_4)_2$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $U(SO_4)_2$ per 100 gms. sat. sol.	Solid Phase.
15.5....	6.61	$U(SO_4)_2.8\,H_2O$	92.0...	6.61	Polymeric 4 Hydrate
20.0....	8.78	»	22.7...	13.68	$U(SO_4)_2.4\,H_2O$
22.4....	9.68	»	25.0 ..	12.62	»
25.0....	11.22	»	30.4...	10.92	»
30.4....	13.88	»	40.0...	8.98	»
40.0....	18.50	»	50.0...	8.32	»
60.0....	29.93	»	80.0...	6.93	»

UREA $CO(NH_2)_2$.

Solubility of Urea in Water. (Pinck and Kelly, 1925.)

The authors call attention to the error made in calculating the results of Speyers, 1902, given on page 737 of the preceding volume of this compilations (see note, p. 1001). They made new determinations by a method which « consisted in heating about 300-400 cc. of urea solution in a water bath in the presence of solid urea to a temperature a few degrees above that at which the solubility was to be determined. The solution was gradually cooled to the desired temperature and, after being maintained at this point for about 10 minutes, a sample (25-35 gms.) was taken ». The dissolved urea was determined by the urease method of Fox and Geldard (*Ind. Eng. Chem.*, 15, 743, 1923). A few determinations made by the method used by Speyers, gave results agreeing with the new determinations.

	Gms. $CO(NH_2)_2$ per 100 gms. H_2O.			Gms. $CO(NH_2)_2$ per 100 gms. H_2O.	
t°.	Calc. from Speyers.	New dets.	t°.	Calc. from Speyers.	New dets.
0.0.....	67.4	67.0	50.0.....	193.0(51°.4)	205.0
10.0.....	87.5(11°)	84.0	50.6.....	–	206.4
20.0.....	97.8(19°.8)	104.7	60.0.....	–	246.0
30.0.....	131.0(31°.7)	136.0	68.5.....	253.0(69°.5)	295.0
39.7.....	–	165.4	70.0.....	–	314.6

Solubility of Urea in Water and in Alcohols.

(Speyers, 1902; See Note p. 1001.)

	In Water.		In Methyl Alcohol.		In Ethyl alcohol.	
t°.	Wt. of 1 cc. sat. sol.	Gms. $CO(NH_2)_2$ per 100 gms. H_2O.	Wt. of 1 cc. sat. sol.	Gms. $CO(NH_2)_2$ per 100 gms. CH_3OH.	Wt. of 1 cc. sat. sol.	Gms. $CO(NH_2)_2$ per 100 gms. C_2H_5OH.
0.....	1.121	67.2	0.861	15.0	0.8213	2.6
10.....	1.134	83.0	0.863	17.7	0.814	4.0
20.....	1.146	101.0	0.869	22.0	0.804	5.4
25.....	1.150	113.0	0.872	24.5	0.805	6.2
30.....	1.156	126.0	0.876	27.7	0.806	7.2
40.....	1.165	155.0	0.890	35.3	0 804	9.3
50.....	1.173	187.0	0.908	46.0	0.803	11.7
60.....	1.180	220.0	0 928	62.8	–	15.1
70.....	1.187	257.0	–	–	–	20.2

Solubility of Urea in Methyl Alcohol. (Walton and Wilson, 1925.)

The saturated solutions were prepared by vigorous stirring at constant temperature. The solutions were analyzed by evaporating and weighing the residue. At the lower temperatures a stable molecular compound, $CO(NH_2)_2.CH_3OH$, is formed.

t°.	Gms. $CO(NH_2)_2$ per 100 gms. CH_3OH.	Solid Phase.	t°.	Gms. $CO(NH_2)_2$ per 100 gms. CH_3OH.	Solid Phase.
−15.20.	10.92	$CO(NH_2)_2$ (Unstable form)	17.45.	3.76	$CO(NH_2)_2.CH_3OH$ (Stable form)
− 9.85.	11.64	»	−17.0..	3.63	»
+ 0 25.	14.24	»	−15.2..	3.93	»
7.33.	16.70	»	− 9.85.	4.88	»
15.23.	19.73	»	+ 0.25.	7.71	»
18.14.	21.16	»	7.33.	10.98	»
−78.0..	0.32	$CO(NH_2)_2.CH_3OH$ (Stable form)	8.03.	11.30	»
−24.9..	2.89	»	15.23.	16.47	»
−21.3..	3.17	»	16.63.	17.72	»
−20.2..	3.25	»	18.14.	19.56	»
−18.1..	3.48	»	18.79.	20.27	»

The transition point between $CO(NH_2)$ and $CO(NH_2)_2 CH_3OH$ is at + 19°.25

Solubility of Urea in Mixtures of Ethyl Alcohol and Quinoline at 20-25°.

(Pucher and Dehn, 1921.)

Per cent C_9H_7N in solvent.	Gms. $CO(NH_2)_2$ per 100 cc. sat. sol.	Per cent C_9H_7N in solvent.	Gms. $CO(NH_2)_2$ per 100 cc. sat. sol.	Per cent C_9H_7N in solvent.	Gms. $CO(NH_2)_2$ per 100 cc. sat. sol.
0.0	5.0	47.5	1.50	65	0.32
10.0	4.0	50.0	1.05	70	0.50
23.2	2.5	55.0	0.64	80	0.19
37.5	1.8	60.0	0.26	90	0.10
				100	0.11

Solubility of Several Substituted Ureas in Alcohol and Other Solvents.

Compound.	Formula.	Solvent.	t°.	Gms. compound per 100 gms. solvent	
Ethyl Urea.....	$NH_2.CO.NHC_2H_5$	Abs. Alcohol	20–25	79.95	(1)
» »	»	Quinoline	»	1.13	(1)
» »	»	Alc. + Quinoline*	»	5.55	(1)
Diphenyl Urea.....	$CO.(NHC_6H_5)_2$	Abs. Alcohol	»	0.84	(1)
» »	»	Quinoline	»	2.50	(1)
» »	»	Alc. + Quinoline*	»	3.12	(1)
s » »	»	Chloroform	»	0.07	(2)
as » »	$NH_2.CO.N(C_6H_5)_2$	Chloroform	20	8.33	(2)
» »	»	Carbon tetrachloride	20	1.56	(2)
o Tolyl Urea.....	–	Chloroform	20	1.46	(2)
» »	–	Carbon tetrachloride	20	0.08	(2)
o Ditolyl Sulfo Urea.	–	Chloroform	20	9 54	(2)
» » » .	–	Carbon tetrachloride	20	0.10	(2)
Thio Urea.....	$NH_2.CS.NH_2$	Water	13	9.18**	(3)
» »	»	Aq.10.2% antipyrine	13	9.17**	(3)

* Equi molecular mixture of Alcohol and Quinoline. ** Gms. per 100 cc. sat. sol.
(1) Pucher and Dehn, 1921; (2) Pawlewski, 1914, 1926; (3) Oliveri Mandala, 1926.

Freezing-point data for mixtures of thiourea and water are given by Kettner, 1919.

URETHAN (Ethyl Carbamate) $NH_2.CO_2.C_2H_5$.

Solubility of Urethan in Several Solvents.

(Speyers, 1902; See Note p. 1001.)

Solubility in Water.

	Wt. of 1 cc. sat. sol.	Mols. $NH_2.CO.C_2H_5$ per 100 mols. sat. sol.	Gms. $NH_2.CO.C_2H_5$ per 100 gms. H_2O.
0.....	1.023	3.61	18.5
10.....	1.033	6.00	31.0
15.....	1.043	15.00	100
20.....	1.060	31.0	240
25.....	1.073	50.0	480
30.....	1.078	65.0	1370
40.....	1.065	77.0	Ca. 2200

Solubility in Methyl Alcohol.

	Wt. of 1 cc. sat. sol.	Mols. $NH_2.CO.C_2H_5$ per 100 mols. sat. sol.	Gms. $NH_2.CO.C_2H_5$ per 100 gms. CH_3OH.
0.....	0.956	31.18	126
10.....	0.977	41.0	190
15.....	0.989	47.5	240
20.....	1.000	54.5	330
25.....	1.013	62.5	500
30.....	1.024	72.0	850
40.....	1.045	89.0	2250

Solubility in Ethyl Alcohol.

$t°$.	Wt. of 1 cc. sat. sol.	Mols. $NH_2.CO.C_2H_5$ per 100 mols. sat. sol.	Gms. $NH_2.CO.C_2H_5$ per 100 gms. C_2H_5OH.
0.....	0.891	23.91	76
10.....	0.930	36.0	120
15.....	0.950	43.0	150
20.....	0.968	50 0	200
25.....	0.985	59.0	280
30.....	1.001	70.0	430
40.....	1.035	88.0	1300

Solubility in Propyl Alcohol.

	Wt. of 1 cc. sat. sol.	Mols. $NH_2.CO.C_2H_5$ per 100 mols. sat. sol.	Gms. $NH_2.CO.C_2H_5$ per 100 gms. C_3H_7OH.
0.....	0.880	19.48	35
10.....	0.906	31.0	66
15.....	0.923	40.0	105
20.....	0.942	51.0	150
25.....	0.963	60.0	220
30.....	0.983	68.0	317
40.....	1.025	85.0	820

Solubility of Urethan in Several Solvents. (Con.)

	Solubility in Chloroform			Solubility in Toluene		
t°.	Wt. of 1 cc. sat. sol.	Mols. $NH_2.CO.C_2H_5$ per 100 mols. sat. sol.	Gms. $NH_2CO.C_2H_5$ per 100 gms. $CHCl_3$.	Wt. of 1 cc. sat. sol.	Mols. $NH_2.CO.C_2H_5$ per 100 mols. sat. sol.	Gms. $NH_2.CO.C_2H_5$ per 100 gms. $C_6H_5CH_3$.
0.....	1.404	27.56	28.4	0.887	1.77	1.7
10.....	1.340	41	53	0.874	5.0	6
15.....	1.310	46	65	0.875	10.0	10
20.....	1.280	53	85	0.883	16.0	18
25.....	1.240	60	117	0.902	25.0	45
30.....	1.203	67	162	0.927	44.0	95
40.....	1.125	80	282	0.995	85.0	620

100 gms. quinoline dissolve 9.72 + gms. Urethan at 20-25°. (Pucher and Dehn, 1921.)

100 gms. sat. solution of **Methyl Urethan** in Water contain about 69.0 gms. $NH_2.CO.CH_3$ at 15°.5.

100 gms. sat. solution of **Propyl Urethan** in Water contain about 7.7 gms. $NH_2.CO.C_3H_7$ at 15°.5. (Führer, 1924.)

URIC ACID $C_5H_4N_4O_3$.

Influence of Hydrogen Ion Concentration Upon the Solubility of Uric Acid. (Jung, 1922, 1923.)

An excess of uric acid was shaken for two hours with buffer mixtures of determined p_H values and the solution either filtered immediately or after 1 or 2 days. The dissolved uric acid was usually determined with Folin's uric acid reagent (phosphotungstic acid) and the standard solution of Benedict. The following results were obtained at the temperatures shown in parentheses with uric acid as the starting material and the indicated buffer mixtures. The calculated results were obtained with the aid of the Michaelis formula derived on the basis of the mass action law.

p_H of solvent.	Gms. Uric Acid dissolved per liter in Buffer mixtures						Calculated gms. Uric Acid per liter.
	A (22°).	KNa (22°).	B (22°).	A (15°-18°).	Na (15°-18°).	K (15°-18°).	
3.24	0.0271	–	–	–	–	–	0.0236
5.0	0.0333	–	–	–	–	–	0.0271
5.4	0.0450	–	–	–	–	–	0.0324
5.6	0.0455	–	–	0.046	0.035	0.032	0.0376
5.8	0.063	0.110	–	0.064	0.042	–	0.0465
6.0	0.142	0.062	–	0.130	0.058	0.056	0.0589
6.2	0.217	0.097	–	0.290	0.080	0.080	0.0795
6.4	–	0.166	–	–	0.120	0.112	0.1123
6.6	–	0.217	–	–	0.170	0.180	0.1640
6.8	–	0.357	0.370	–	0.270	0.220	0.2465
7.0	–	0.500			0.430	0.357	0.360
7.2		0.816			0.54	0.600	0.583
7.4		1.10	–	–	0.97	0.877	0.911
7.6	–	1.48	1.54	–	1.20	(1.00)	1.43
7.8		(1.74)	2.08		(1.33)	(1.19)	2.25
8.0		(2.22)	3.44		(1.39)	(1.19)	3.56
8.2		(2.50)	(3.77)	–	–	–	5.62
8.7	–	–	(5.26)	–	–	–	–

Buffer Mixture A = 0.1 *n* CH_3COONa + 0.1 *n* CH_3COOH (p_H = 3.24 — 6.20).
» » KNa = 0.067 mol. KH_2PO_4 + 0.067 mol. Na_2HPO_4.
» » B = 0.1 mol. Borax + 0.2 mol. Boric Acid (p_H = 6.77 — 9.24).
» » Na = 0.067 mol. NaH_2PO_4 + 0.067 mol. Na_2HPO_4 (p_H = 5.6 — 8.2).
» » K = 0.067 mol. KH_2PO_4 + 0.067 mol. K_2HPO_4.

Results are also given for determinations made at 37° and with sodium urate as the starting material. The influence of the anion present and of the time of shaking and of standing was also studied. Similar curves were obtained in all cases and they show that the greatest effect upon the solubility of uric acid, resulting from a change of p_H, occurs in the vicinity of the neutral point, which is the reaction of the blood.

The Solubility of Uric Acid in Buffer Solutions at 37°.

(Harpuder and Erbsen, 1924.)

Buffer mixtures were prepared with primary and secondary sodium phosphate, sodium acetate and acetic acid, and sodium lactate and lactic acid. Each was diluted to 100 cc. with distilled or conductivity water. An excess of a weighed amount of the purest uric acid was added to each solution and the mixture shaken in a thermostat one-fourth of an hour and then allowed to stand one hour. The undissolved uric acid was filtered out and weighed, and that dissolved calculated by difference. A direct determination of the uric acid in the saturated solution was also made by titration with sulfuric acid and potassium permanganate. The average of the two determinations was taken as the solubility in each buffer mixture. A determination of the p_H of each saturated solution was made with the gas chain.

Per 100 cc. Buffer mixture.			Gms. Uric Acid	Per 100 cc. Buffer mixture.			Gms. Uric Acid
Cc. 0.1 *n* CH_3COONa.	Cc. 0.1 *n* CH_3COOH.	p_H of sat. sol.	per liter sat. sol.	Cc. 0.1 *n* CH_3COONa.	Cc. 0.1 *n* CH_3COOH.	p_H of sat. sol.	per liter sat. sol.
10	0.0	6.16	0.260	10	9.6	4.78	0.122
10	0.3	6.00	0.213	10	19.2	4.45	0.110
10	0.6	5.62	0.198	10	38.4	4.14	0.093
10	1.2	5.42	0.175	0	40.0	3.26	0.068
10	2.4	5.23	0.137	100 cc. 1.0 *n* CH_3COOH		0.1	0.086
10	4.8	5.06	0.129				

Per 100 cc. Buffer mixture.			Gms. Uric Acid	Per 100 cc. Buffer mixture.			Gms. Uric Acid
Cc. 0.33 mol. Na_2HPO_4.	Cc. 0.33 mol. Na_2HPO_4.	p_H of sat. sol.	per liter sat. sol.	Cc. 0.1 *n* Na lactate.	Cc. 0.1 *n* Lactic acid.	p_H of sat. sol.	per liter sat. sol.
1.8	3.6	6.78	1.171	10	0	5.25	0.155
3.0	3.0	6.61	0.780	10	0.3	4.99	0.144
4.5	2.25	6.47	0.510	10	0.6	4.84	0.135
6.0	1.5	6.21	0.361	10	2.4	4.53	0.107
7.2	0.9	5.97	0.249	10	4.8	4.15	0.098
7.99	0.5	5.71	0.184	0	40.0	2.78	0.098
8.47	0.26	5.52	0.153	100 cc. 0.001 *n* HCl		3.29	0.054
9.00	0.0	4.61	0.097	100 cc. 0.001 *n* H_2SO_4		3.29	0.054

The curves obtained by plotting the above results show that the solubility of uric acid in acetate and lactate buffer mixtures differs from that in phosphate buffers. Additional evidence on this point, and on the marked tendency of uric acid to form supersaturated solutions, was desired. Further determinations were therefore, made by Harpuder, 1924, using a method designed to show more clearly the effect of the anion (at higher concentrations) upon the solubility of uric acid.

An amount of dried uric acid, which was chosen to yield an equal excess in all cases, was dissolved by warming, in a portion of the alkaline part of the buffer mixture. The remaining portions were then added in amounts such that the concentration of Na^+ remained constant, and the mixture was diluted to 40 cc. The amount of added uric acid was controlled by a colorimetric determination made with phosphotungstic acid and sodium cyanide. The mixture was shaken one-fourth of an hour at 37° and then allowed to stand at this temperature for 36 hours. It was then filtered and the uric acid again determined colorimetrically in one portion of the filtrate and the p_H measured in another by means of the gas chain.

The p_H corresponding to the beginning of precipitation of uric acid or urate was considered to be a more satisfactory indication of the solubility influence than the amount of uric acid dissolved. The results of such measurements, made under conditions so chosen that all factors remained constant except the concentration of the anión, showed that the precipitation of uric acid from :

Phosphate buffer mixture begins at p_H = about 6.8
Acetate » » » » » = » 4.9
Lactate » » » » » = » 4.2

On the basis of many experiments and calculations it was concluded that the failure of the excess of mono urate to precipitate from its supersaturated solution depends upon the simultaneous presence of undissociated uric acid and *diurate*, and accordingly is possible first at a definite p_H upwards of > 6.7 to 6.8. The failure of uric acid complexes to precipitate from acetic acid and lactic acid mixtures is caused by supersaturation of undissociated uric acid due to the buffer acid. Non electrolytes and colloids may favorably influence the holding of uric acid complexes in solution.

By constant agitation at 14°. 0 ± 0°. 5 for more than 24 hours Biltz and Herrmann, 1923, found that 1000 cc. water dissolve 0.0223 gm. uric acid when equilibrium was approached from below, and 0.0295 gm. when equilibrium was approached from above.

100 gms. Abs. Alcohol dissolve 0.68 gm uric acid at 20-25°. (Pucher and Dehn, 1921.)
» Quinoline » 1.13 » » » » » » »
» equi mol. mixture of alcohol and quinoline dissolve 0.61 gm. uric acid at 20-25°.

Methyl URIC ACIDS.

Solubility of Ordinary Uric Acid and of Several Methyl Uric Acids in Water at the Boiling Point.

(Biltz and Heyn, 1917.)

About 400 cc. of water containing several grams of the given uric acid were boiled under a reflux condenser for 2 hours. The saturated solution was analyzed by evaporating a weighed sample in a platinum dish and weighing the residue after drying one-fourth of an hour at 110°.

Compound.	Gms. compound per 1000 cc. H_2O.	Compound.	Gms. compound. per 1000 cc. H_2O.
Uric acid.....	0.800	α Methyl Uric acid	5.002
9-Methyl Uric acid...	0.546	3.7 Di methyl Uric acid	3.448
δ » » » ...	1.588	90 % δ + 10 % 9-Methyl Uric acid	2.777
ζ » » » ...	2.105	70 % δ + 30 % 9- » » »	3.703

URSON $C_{30}H_{48}O_3.2H_2O$.

100 gms. 95 % alcohol dissolve about 0.9 gm. Urson at 20° and 2.8 gms. at the b. pt.

100 gms. Ether dissolve about 1.5 gm. Urson at 20°. (Dodge, 1918.)

VALERIC ACID $n\ CH_3(CH_2)_3COOH$.

Distribution of Valeric Acid Between :

Water and Benzene at 22°. (Brown and Bury, 1923.)

Normality of $CH_3(CH_2)_3COOH$ in H_2O layer.	Normality of $CH_3(CH_2)_3COOH$ in C_6H_6 layer.
0.1357	1.848
0.1149	1.400
0.0919	0.929
0.0610	0.445
0.0479	0.289
0.0383	0.191
0.0235	0.0793
0.0178	0.0481
0.0136	0.0292

Water and Chloroform at 25°. (Smith, 1921, 1922.)

Millimols. $CH_3(CH_2)_3COOH$ per liter of H_2O layer (C_1).	Millimols. $CH_3(CH_2)_3COOH$ per liter of $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
0.890	0.70	1.80
0.650	1.35	2.08
0.910	2.00	2.20
1.825	4.625	2.53

Distribution of Valeric Acid Between Water and Ethyl Ether.

Results at 22°. (Behrens, 1926.)

Concentration in H_2O layer (C_1).	Concentration in $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.00315	0.0675	21.4
0.00413	0.0907	21.9
0.00507	0.1145	22.6
0.00671	0.1528	22.8
0.01015	0.2358	23.2
0.0161	0.4025	25.1
0.0164	0.4155	25.3

Results at 25°. (Smith, 1921, 1922.)

Millimols. per liter in H_2O layer (C_1).	Millimols. per liter in $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.0775	1.0225	13.20
0.1125	1.4575	12.92
0.1700	2.2000	12.95
0.3000	4.3000	14.32
0.3900	5.6700	15.52

Distribution of Valeric Acid at 25° Between Water and Xylene.

(Smith, 1921, 1922.)

Millimols. $CH_3(CH_2)_3COOH$ per liter. H_2O layer (C_1).	Millimols. $CH_3(CH_2)_3COOH$ per liter. $C_6H_4(CH_3)_2$ layer (C_2).	$\frac{C_2}{C_1}$.
0.6625	0.3125	0.472
1.150	0.625	0.543
1.500	0.925	0.616
2.175	1.575	0.725
2.30	1.70	0.74
5.00	5.00	1.00
8.40	11.6	1.38

Iso VALERIC ACID $(CH_3)_2.CH.CH_2COOH$.

Distribution of Iso Valeric Acid Between :

Water and Chloroform at 25°. (Smith, 1921, 1922.)

Millimols. per liter in H_2O layer (C_1).	Millimols. per liter in $CHCl_3$ layer (C_2).	$\frac{C_2}{C_1}$.
1.239	1.162	0.94
1.585	1.65	1.04
2.45	2.90	1.182
3.35	4.55	1.36

Water and Ethyl Ether at 16-17°. (Behrens, 1926.)

Concentration in H_2O layer (C_1).	Concentration in $(C_2H_5)_2O$ layer (C_2).	$\frac{C}{C_1}$.
0.0051	0.0993	19.5
0.0078	0.1533	19.7
0.0125	0.257	20.5

Water and Ethyl Ether at 25°. (Smith, 1921, 1922.)

Millimols. per liter in H_2O layer (C_1).	Millimols. per liter in $(C_2H_5)_2O$ layer (C_2).	$\frac{C_2}{C_1}$.
0.2500	1.875	7.50
0.4437	3.275	7.70
0.5750	4.500	7.82
0.8875	7.087	7.98
1.325	11.00	8.32

Distribution of Iso Valeric Acid at 25° Between : (Smith, 1921, 1922.)

Water and Xylene.

Millimols. per liter in H_2O layer (C_1).	Xylene layer (C_2).	$\frac{C_2}{C_1}$.
1.875	0.600	0.320
2.35	0.875	0.372
3.85	1.55	0.403
4.275	1.925	0.450
5.30	2.60	0.490
6.15	3.15	0.512

Acetone and Glycerol.

Millimols. per liter in Acetone layer (A).	Glycerol layer (G).	$\frac{A}{G}$.
4.75	0.1125	42.3
5.15	0.1375	37.4
10.30	0.300	34.4
23.00	0.500	46.0

VANILLIN $C_6H_3CHO.OCH_3.OH$, 1.3.4.

Solubility of Vanillin in Aqueous Solutions of Ethyl Alcohol

(Mange and Ehler, 1924.)

The temperatures were determined at which weighed amounts of vanillin just dissolved in measured amounts of solvent. The results were plotted and the following table constructed from the diagram.

Per cent C_2H_5OH in solvent.	Gms. $C_6H_3CHO.OCH_3.OH$ per 100 cc. solvent.		
	at 4°.4.	at 15°.6.	at 23°.9.
0 (=H_2O...	0.30	0.52	0.90
5.....	0.40	0.60	1.10
10.....	0.45	0.75	1.35
15.....	0.50	1.00	1.90
20.....	0.60	1.35	2.80
25.....	0.90	2.00	4.70
30.....	1.40	3.30	

100 gms. abs. alcohol dissolve 67.22 gms. vanillin at 20-25° (Pucher and Dehn, 1921.)
100 gms. quinoline » 5.51 » » » » » » »
100 gms. equi. mol. mixture of alcohol and quinoline dissolve 64.30 gms. vanillin at 25°.

Solubility of Vanillin in Aqueous Solutions of Glycerol.

(Mange and Ehler, 1924.)

The determinations could not be made at temperatures below 50° by the method used with alcohol solutions, due to the failure of vanillin to separate from the viscous glycerol mixtures, even on being supercooled by as much as 20°. An arbitrary method, which resembles the procedure used by flavor manufacturers in making vanillin solutions, was employed. This consisted in preparing, for each concentration of glycerol, a series of tubes in which different amounts of vanillin were dissolved by warming. These were kept at a nearly constant temperature (25° in one case and 13° in another) and shaken occasionally, during a period of one month. The mixtures which remained clear were seeded with a few crystals of vanillin in order to detect super saturation. Those which had been kept at 13° were nearly all supersaturated. The results were plotted and the following table was prepared. It shows the maximum amount of vanillin which will remain in solution under the usual conditions of preparing and storing commercial vanillin solutions.

Per cent Glycerol in solvent.	Gms. $C_6H_3CHO.OCH_3.OH$ per 100 cc. solvent at		
	25°.	13° (without seeding).	13° (after seeding).
0 (=H_2O...	1.30	1.05	0.75
10.....	1.50	1.30	0.82
20.....	1.70	1.50	0.90
30.....	2.00	1.90	1.00
40.....	2.40	2.10	1.20
50.....	2.80	2.50	1.35
60.....	3.30	2.90	1.70
70.....	4.00	3.40	2.25

100 cc. glycerol saturated by being agitated with excess of vanillin at 25°, and analyzed by extraction with ether, contained from 3.9 to 5.1 gms. $C_6H_3CHO.OCH_3.OH$. (Taylor and Bebie, 1924).

SOLUBILITY OF VANILLIN IN AQUEOUS SOLUTIONS OF GLYCEROL AT TEMPERATURES BETWEEN 0°.2 AND 60°. (de Groote, 1920.)

The determinations were made by the method described under Coumarin on page 1190.

Per cent 95 % Glycerol in solvent.	Gms. Vanillin dissolved per 100 cc. sat. solution at					
	0°.2.	20°.	30°.	40°.	50°.	60°.
0.0 (= H_2O).....	0.68	1.25	1.50	2.65	4.80	5.05
5.0.....	0.70	1.50	1.60	3.00	4.90	5.20
10.0.....	0.75	1.75	1.80	3.40	5.50	6.50
15.0.....	0.85	1.95	2.35	4.00	6.25	7.20
20.0.....	0.95	2.30	2.50	4.20	7.50	8.25
25.0.....	1.10	2.50	2.70	–	8.75	11.20
30.0.....	1.25	2.95	3.00	5.3	10.0	12.8
40.0.....	1.50	3.50	3.80	6.0	12.0	15.0
50.0.....	2.06	4.50	5.00	7.4	14.8	20.0

VERATRINE (Cevadine) $C_{32}H_{49}NO_9$.

SOLUBILITY OF VERATRINE IN WATER. (Kolthoff, 1925.)

The *dissociation constant* was calculated from colorimetric p_H measurements in mixtures of 0.01 *n* veratrine hydrochloride and 0.01 *n* Na OH to be $K = 7.2.10^{-6}$. It is, therefore, a fairly strong base. For the determination of the *solubility product* it was found that a mixture of 5.0 cc. of 0.05 *n* veratrine hydrochloride + 0.8 cc. 0.01 *n* Na OH gave no precipitate after standing 1 day. With 0.9 cc. 0.1 *n* Na OH a crystalline deposit appeared. The p_H of the saturated solution was 8.5. The $[OH] = 2.10^{-6}$. The veratrine salt conc. $= 3.10^{-2}$ *n* and the calculated solubility product, $L_{veratrine} = 6.10^{-8}$. From K and L the solubility of veratrine was calculated to be 8.10^{-3} gm. mols. per liter at 15°.

VERONAL (Diethyl Barbituric Acid) $CO < NHCO)_2 > C.(C_2H_5)_2$.

100 cc. 86.5 % glycerol ($d = 1.2326$) dissolve 0.78 gm. veronal at 20°.
» 98.5 % » ($d = 1.2645$), » 0.96 » » » »
(Holm, 1921, 1922.)

WATER H_2O.

SOLUBILITY OF WATER IN BENZENE. (Hill, 1923.)

A new thermostatic method was employed. This is based upon the unusual solubility relations of silver perchlorate. This compound is soluble in various organic solvents and exceptionaly soluble in water. Consequently, the presence of small amount of water in an organic solvent greatly increases the solubility of silver perchlorate in that solvent. The method consists in making a reference curve for the solubility of silver perchlorate in the organic solvent containing known amounts of water. Saturated solutions of water in the organic solvent are then made at various temperatures and each of these used as solvent for silver perchlorate at the temperature of the reference curve. By comparison with the reference curve the percentage of water in the solvent becomes known. The data for the reference curve of silver perchlorate in benzene + water mixtures at 25° will be found under silver perchlorate at the bottom of page 1401. The estimated results for the solubility of water in benzene are as follows.

t°.	Gms. H_2O per 100 gms. sat. solution.	t°.	Gms. H_2O per 100 gms. sat. solution.	t°.	Gms. H_2O per 100 gms. sat. solution.
3.0.....	0.035	37.5.....	0.109	65.0.....	0.232
5.4.....	0.037	40.0.....	0.118	66.0.....	0.238
15.0.....	0.051	50.0.....	0.158	69.5.....	0.258
23.0.....	0.063	55.0.....	0.181	77.0.....	0.304
25.0.....	0.072	57.5.....	0.193		

SOLUBILITY OF WATER IN SEVERAL ORGANIC SOLVENTS. (Clifford, 1921.)

The saturated solutions were analyzed by volatilizing the sample and absorbing the moisture in a dehydrating agent ($CaCl_2$) which does not absorb or react with the organic solvent.

Solvent.	t°.	Gms. H_2O per 100 gms. sat. sol.	Solvent.	t°.	Gms. H_2O per 100 gms. sat. sol.
Benzene	21.0	0.046	Carbon disulfide	25.0	0.010
»	26.6	0.056	» »	26.0	0.011
»	42.0	0.088	» »	27.0	0.012
»	55.0	0.113	Carbon tetrachloride.	24.0	0.010
Chloroform	24.5	0.084	» »	28.5	0.013
»	26.7	0.107	Gasoline	25.0	0.0085–0.0100
»	27.8	0.116	»	35.0	0.0121–0.0161
			»	37.5	0.0145–0.0175

XANTHALINE (Mono) PICRATE (m. pt. 212°.5).

100 gms. sat. solution of Xanthaline Picrate in water contain 0.01 gm. of the compd. at 15°.

100 gms. sat. solution of Xanthaline Picrate in abs. alcohol contain 0.022 gm. of the compd. at 15°.

100 gms. sat. solution of Xanthaline Picrate in acetone contain 0.34 gm. of the compd. at 15°. (Maplethorpe and Evers, 1925.)

XANTHONE (9–Xanthenone) $C_{13}H_8O_2$.

100 gms. Carbon Tetrachloride dissolve 0.96 gm. Xanthone at 20°
» » Chloroform » 11.24 » » » » } (Pawlewski, 1914, 1926.)

XYLENE $C_6H_4(CH_3)_2$.

SOLUBILITY OF XYLENE IN WATER.

The solubility of xylene in water is given by Horiba, 1917, as 0.018 but the isomer used, the temperature or the terms in which the result is expressed, are not defined.

Determinations of the solubility of xylene (Isomer?) in superheated water were made by Jaeger, 1923. A large shaking autoclave of more than two liters capacity was used. A measured volume of the saturated solution was cooled and after it had separated into two layers, the volume of xylene was measured.

t°.	150°.	200°.	250°.
Cc. Xylene per 100 cc. H_2O	0.1	0.35	1.1

100 gms. sat. solution of commercial xylene in 92 wt. per cent ethyl alcohol contain 83.4 gms. xylene at 15°. (Ormandy and Craven, 1921.)

100 gms. sat. solution of *hexahydro xylene* in 92 wt. per cent ethyl alcohol contain 26.4 gms. of the compound at 15°. (Ormandy and Craven, 1921.)

Freezing-point data for mixtures of *m* and *p* xylene are given by Nakatsuchi, 1926.

Trinitro *m* **XYLENE** $(NO_2)_3C_6H(CH_3)_2(m)$ (m. pt. 176°).

SOLUBILITY OF TRINITRO META XYLENE IN SEVERAL SOLVENTS. (Desvergnes, 1920.)

Solvent.	Density of solvent.	B. pt. of solvent.	Gms. $(NO_2)_3C_6H(CH_3)_2$ per 100 cc. solvent at 15°.	90°.	B. pt.
Ethyl alcohol (95 %).	$d_{20} = 0.8076$	78.1	0.09	–	0.65
Amyl alcohol	$d_{20} = 0.8126$	128.4	0.14	1.29	10.30
Acetone	$d_{15} = 0.8399$	57.2	0.95	–	4.27
Ethyl acetate	$d_{15} = 0.9046$	76.1	0.77	–	5.43
Acetic acid (glacial).	$d_{20} = 1.0527$	115.3	0.40	5.30	15.03
Aniline	$d_{18} = 1.0241$	179.5	3.87	34.48	–
Nitric acid (48°)	$d_{15} = 1.5006$	–	5.51	51.10	–
Benzene	$d_{20} = 0.8777$	80.35	0.92	–	10.00
Chloro benzene	$d_{21.5} = 1.1050$	130.8	1.06	11.49	108.68
Nitro benzene	$d_{15} = 1.2058$	206	2.56	19.60	–
Carbon tetrachloride.	$d_{15} = 1.6008$	75.3	0.08	–	0.96
m Xylene	$d_{15} = 0.8683$	138.8	0.83	9.25	–
Xylene (essence)	$d_{15} = 0.8154$	134.5	–	–	20.61

100 gms. glycol diacetate dissolve 0.8 gm. trinitro xylene at 25°. (Taylor and Rinkenbach, 1926.)

XYLIDINES $(CH_3)_2C_6H_3NH_2$, 1, 3, 4 and 1, 4, 3.

DISTRIBUTION OF XYLIDINES AT 25° BETWEEN WATER AND XYLENE. (Smith, 1921, 1922.)

Results for the 1, 3, 4 Compound.

Millimols. per liter		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	Xylene layer (C_2).	
0.1070	1.200	11.2
0.1385	1.525	11.0
0.2875	3.3125	11.5

Results for the 1, 4, 3 Compound.

Millimols. per liter		$\frac{C_2}{C_1}$.
H_2O layer (C_1).	Xylene layer (C_2).	
0.0740	1.100	14.9
0.1420	2.150	15.1
0.2875	4.462	15.5

XYLOQUINONE (p) (Phlorone) $C_6H_2O_2(CH_3)_2$.

100 gms. abs. alcohol dissolve 1.12 gms. $C_6H_2O_2(CH_3)_2$ at 20°–25°.
» quinoline » 3.02 » »
» équi. mol. mixture of alcohol and quinoline dissolve 4.69 gms. $C_6H_2O_2(CH_3)_2$ at 20°–25°. (Pucher and Dehn, 1921.)

YOHIMBINE (Quebrachine) $C_{21}H_{26}N_2O_3$.

100 gms. C_2H_5OH dissolve 4.0 gms. $C_{21}H_{26}N_2O_3$ cold and 10.0 gms. at b. pt.
» » H_2O » 0.735 gms. $C_{21}H_{26}N_2O_3.HCl$ cold and 3.33 gms. at b. pt.
» » » » 0.36 gm. $(C_{21}H_{26}N_2O_3)_2C_2H_2O_4$ (oxalate) at the b. pt.
» » C_2H_5OH » 0.27 gm. $(C_{21}H_{26}N_2O_3)_2C_4H_7O_6.6H_2O$, (tartrate) cold and 0.625 gm. at the b. pt. (Fourneau and Page, 1914.)

YTTERBIUM CHLORIDE $YbCl_3.6H_2O$.

SOLUBILITY OF YTTERBIUM CHLORIDE IN AQUEOUS HYDROCHLORIC ACID OF DENSITY 1.1051. (Williams, Fogg and James, 1925.)

Constant rotation in a thermostat for 9 hours and approaching equilibrium from above and below was employed.

t°.	Gms. $YbCl_3$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $YbCl_3$ per 100 gms. sat. sol.	Solid Phase.
10.....	32.00	$YbCl_3.6H_2O$	40.....	33.84	$YbCl_3.6H_2O$
20.....	32.38	»	50.....	34.88	»
30.....	33.03	»			

YTTRIUM ACETATE $Y(CH_3COO)_3.4H_2O$.

100 gms. sat. solution of yttrium acetate in water prepared by constant rotation for 24 hours contained 8.28 gms. $Y(CH_3COOH)_3$ at 25°. (Meyer and Müller, 1920).

YTTRIUM BROMIDE YBr_3.

SOLUBILITY OF YTTRIUM BROMIDE IN WATER. (Crew, Stewart and Hopkins, 1925.)

The solutions were saturated by frequent agitation during 5 hours and equilibrium was approached from above and from below.

t°.	Gms. YBr_3 per 100 gms. H_2O.	t°.	Gms. YBr_3 per 100 gms. H_2O.
0.....	64.0	75.....	111.3
30.....	83.3	95.....	129.6
50.....	96.1		

YTTRIUM CHLORIDE $YCl_3.6H_2O$.

SOLUBILITY OF YTTRIUM CHLORIDE IN WATER.
(Crew, Steinert and Hopkins, 1925; Williams, Fogg and James, 1925.)

t°.	Gms. YCl_3 per 100 gms. sat. sol.		Solid Phase.	t°.	Gms. YCl_3 per 100 gms. sat. sol.		Solid Phase.
	C. S. and H.	W. F. and J.			C. S. and H.	W. F. and J.	
0....	42.36	43.60	$YCl_3.6H_2O$	40...	43.30	44.70	$YCl_3.6H_2O$
10...	42.65	43.85	»	50...	43.45	45.07	»
20...	42.87	44.08	»	60...	43.60	–	»
25...	42.95	44.20	»	70...	43.75	–	»
30...	43.07	44.33	»	80...	43.86	–	»

Solubility of Yttrium Chloride in Aqueous Hydrochloric Acid of Density 1.1051. (Williams, Fogg and James, 1925.)

Constant agitation in a thermostat for 9 hours and approaching equilibrium from above and below was employed.

t°.	Gms. YCl_3 per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. YCl_3 per 100 gms. sat. sol.	Solid Phase.
10.....	24.35	$YCl_3.6H_2O$	40.....	26.52	$YCl_3.6H_2O$
20.....	24.63	»	50.....	27.55	»
30.....	25.48	»			

YTTRIUM LACTATE $Y(C_3H_5O_3)_3.2H_2O$.

1000 cc. sat. solution of yttrium lactate in water prepared by constant rotation in a thermostat contain 1.096 gm. $Y(C_3H_5O_3)_3.2H_2O$ at 20°. (Jantsch, 1926.)

YTTRIUM NITRATE $Y(NO_3)_3$.

Solubility of Yttrium Nitrate in Water. (Crew, Steinert and Hopkins, 1925.)

Saturation was obtained by frequent agitation during 5 hours and approaching equilibrium from above and from below.

t°.	Gms. $Y(NO_3)_3$ per 100 gms. H_2O.	t°.	Gms. $Y(NO_3)_3$ per 100 gms. H_2O.
0.0.....	93.1	60.2.....	200.0
22.5.....	134 5	66.5.....	211.0
35.0.....	155.0		

YTTRIUM SULFATE $Y_2(SO_4)_3$.

Solubility of Yttrium Sulfate in Water. (Crew, Steinert and Hopkins, 1925.)

t°.	Gms. $Y_2(SO_4)_3$ per 100 gms. H_2O.	t°.	Gms. $Y_2(SO_4)_3$ per 100 gms. H_2O
3.6.....	7.94	50.0.....	5.37
15.8.....	7.49	75.0.....	3.22
25.0.....	7.20	95.0.....	2.03

XENON Xe.

Solubility of Xenon in Water and in Aniline. (Antropoff, 1919.)

The determinations were made with the highest accuracy possible. An apparatus was used in which the solvent and its vapor touched no cock. The results are expressed in terms of the Bunsen absorption coefficient β, as modified by Kuenen. They show the volume of xenon in cubic centimeters (reduced to 0° and 760 mm.) dissolved by *one gram* of solvent.

t°.	Coef. of absorption β in Water.	Coef. of absorption β in Aniline.	t°.	Coef. of absorption β in Water.	Coef. of absorption β in Aniline.
0.....	0.242	—	30.....	0.098	0.455
10.....	0.174	0.669	40.....	0 082	0.431
20.....	0.123	0.501	50.....	0.073	0.411

ZINC Zn.

Solubility of Zinc in Aqueous Potassium Cyanide Solutions. (White, 1919.)

The weight of zinc dissolved per 24 hours from rectangular (2.5 × 1.5 cm.) pieces of ordinary commercial rolled sheet zinc 0.03 mm. in thickness, when suspended in aqueous potassium cyanide solutions, was determined. Uniform conditions were maintained in each experiment but the temperature was not held constant. The influence of oxygen concentration, cyanide concentration, alkalinity, etc. was studied. The main reaction in presence of oxygen is

$$Zn + 4KCN + O + H_2O = K_2Zn(CN)_4 + 2KOH.$$

Therefore, 6.0 milligrams of oxygen per liter is equivalent to 0.0089 per cent KCN and to 24.5 milligrams of Zn per liter. However, in the absence of oxygen some zinc may dissolve. Numerous tables and curves are given.

ZINC BENZOATE Chloro, Nitro, etc., BENZOATES.

SOLUBILITY OF EACH SEPARATELY IN WATER AT 20°. (Ephraim and Pfister, 1925.)

Compound.	Formula.	Gms. anhydrous compound per 100 cc. sat. sol.
Zinc Benzoate.....	$Zn(C_6H_5.COO)_2.H_2O$	2.048
» 4-Chloro Benzoate....	$Zn(C_6H_4.Cl.COO)_2.2H_2O$	0.649
» 4-Methoxy »	$Zn(C_6H_4.OCH_3.COO)_2.H_2O$..	1.174
» 4-Nitro ... »	$Zn(C_6H_4.NO_2.COO)_2.2H_2O$..	0.556
» 4-Oxy .... »	$Zn(C_6H_4.OH.COO)_2.8H_2O$...	1.687

ZINC BROMIDE $ZnBr_2$.

100 cc. pyridine dissolve 4.4 gms. $ZnBr_2$ at 18°. (Müller, R., 1924.)

ZINC CARBONATE $ZnCO_3$.

100 gms. of a sat. solution of $ZnCO_3$ in water at 18° and in contact with CO_2 at a pressure of 1 atmosphere contain 0.07 gm. $ZnCO_3$. At a pressure of 56 atmospheres of CO_2 0.084 gm. $ZnCO_3$ are dissolved. (Haehnel, 1924.)

ZINC CHLORIDE $ZnCl_2$.

SOLUBILITY OF ZINC CHLORIDE IN PYRIDINE. (Mason and Mathews, 1925.)

The determinations were made with a modified Meyerhoffer-Saunders apparatus (Walton and Judd, *J. Am. Chem. Soc.*, 33, 1039, 1911).

t°.	Gms. $ZnCl_2$ per 100 gms. sat. sol.	Solid Phase.	t°.	Gms. $ZnCl_2$ per 100 gms. sat. sol.	Solid Phase.
0....	1.60	$ZnCl_2.2C_5H_5N$	45....	4.66	$ZnCl_2.2C_5H_5N$
5....	1.80	»	55....	5.85	»
10....	2.02	»	65....	7.33	»
15....	2.28	»	75....	9.06	»
20....	2.55	»	85....	11.11	»
24.12.	2.80	»	95....	13.60	»
35....	3.67	»	105....	16.26	»

100 gms. sat. solution of zinc chloride in selenium oxychloride ($SeOCl_2$) contain 1.10 gms. $ZnCl_2$ at 25°. (Wise, 1923.)

ZINC CINNAMATE $ZnC_{18}H_{14}O_4.2H_2O$.

100 cc. sat. solution of zinc cinnamate in water contain 0.15 gm. $ZnC_{18}H_{14}O_4$ at 20°. (Ephraim, and Pfister, 1925.)

ZINC FUMARATE $ZnC_4H_2O_4.5H_2O$.

100 gms. H_2O dissolve 1.96 gms. of the compound at 30°. The sat. solution was analyzed by evaporating to dryness and drying the residue at 100°. The result, therefore, probably refers to the anhydrous compound. (Weiss and Downs, 1923.)

ZINC HELIANTHATE $Zn(C_{14}H_{14}N_3SO_3)_2.4H_2O$.

1000 cc. H_2O dissolve 0.098 gm. of the hydrated salt at 20-25°. (Stark and Dehn, 1918.)

ZINC HYDROXIDE $Zn(OH)_2$.

SOLUBILITY OF ZINC OXIDE (HYDROXIDE) IN WATER AT 18°.
(Remy and Kuhlmann, 1924; Remy, 1925.)

The determinations were made by (1) the ordinary electrolytic conductivity method, taking into consideration the carbonate content of the water and assuming that the zinc is present as completely dissociated hydroxide, and (2) by a conducto-titrametric method.

By method (1) there was found 0.00306 gms. or 0.038 millimols ZnO per liter.
» » (2) » » 0.00292 » 0.036 » » »

ZINC Nitroso β Phenyl HYDROXYL AMINE

100 gms. H_2O dissolve $4.1.10^{-4}$ gm. of the compound at 18°. (Martin.)

ZINC IODIDE ZnI_2.

100 cc. pyridine dissolve 12.6 gms. ZnI_2 at 18°. (Müller, R., 1924.)

ZINC PHOSPHATES $Zn_3(PO_4)_2.4H_2O$, $ZnHPO_4.3H_2O$, $Zn(H_2PO_4)_2.2H_2O$.

Equilibrium in the System Zinc Oxide, Phosphorus Pentoxide and Water at 25° and at 37°. (Eberly, Gross and Crowell, 1920.)

The flasks containing the mixtures were kept in thermostats and occasionally shaken during several weeks. The analyses of the saturated solutions and solid phases were repeated at intervals of two weeks untill constant results were obtained.

Results at 25°.

Gms. per 100 gms. sat. sol. P_2O_5.	Gms. per 100 gms. sat. sol. ZnO.	Solid Phase.
5.08	2.38	$Zn_3(PO_4)_2.4H_2O$
9.76	4.65	»
12.42	6.13	»
13.52	6.56	»
14.00	6.74	»
14.37	6.97	»
14.83	7.37	»
15.98	7.71	$ZnHPO_4.3H_2O$
17.15	8.26	»
18.33	8.73	»
22.75	10.74	»
26.48	12.47	»
28.70	13.48	»
30.09	14.16	»
32.55	15.40	»
33.79	15.82	»
37.15	17.30	»
39.61	18.04	»
42.05	16.14	$Zn(H_2PO_4)_2.2H_2O$
44.53	13.20	»
48.70	9.58	»
52.25	7.64	»
55.97	7.23	»

Results at 37°.

Gms. per 100 Gms. sat. sol. P_2O_5.	Gms. per 100 Gms. sat. sol. ZnO.	Solid Phase.
4.87	2.08	$Zn_3(PO_4)_2.4H_2O$
9.46	4.12	»
13.60	6.27	»
18.13	8.78	»
19.48	9.66	»
20.32	10.16	»
21.96	10.88	$ZnHPO_4.3H_2O$
26.75	13.26	»
29.65	14.77	»
33.39	17.06	»
34.58	17.92	»
36.13	16.00	$ZnHPO_4.H_2O$
37.80	15.78	»
39.93	16.12	»
42.42	15.81	»
42.65	16.82	»
44.89	17.83	»
46.11	18.05	$Zn(H_2PO_4)_2.2H_2O$
46.41	14.74	»
48.99	12.55	»
51.35	11.26	»
51.92	11.12	»
54.32	10.82	»

ZINC SULFATE $ZnSO_4.6H_2O$.

Solubility of Zinc Sulfate in Water.

(Bury, 1924; Cohen and Hetterschij, 1925; Cohen and Moesveld, 1925.)

The very exact determinations of these authors were plotted and the following table constructed from the curves.

t°.	Gms. $ZnSO_4$ per 100 gms. H_2O.	Solid Phase.
0.....	41.61	$ZnSO_4.7H_2O$ (Rhombic)
5.....	44.41	»
10.....	47.25	»
15.....	50.34	»
20.....	53.80	»
25.....	57.45	»
30.....	61.30	»
35.....	66.17	»
37.9 tr. pt.	69.4	» + $ZnSO_4.6H_2O$
10.....	54.4	$ZnSO_4.7H_2O$ (Monoclinic)
15.....	57.0	»
20.....	60.0	»
24.8 tr. pt.	63.4	» + $ZnSO_4.6H_2O$

t°.	Gms. $ZnSO_4$ per 100 gms. H_2O.	Solid Phase.
10.....	58.6	$ZnSO_4.6H_2O$
15.....	60.2	»
20.....	61.8	»
24.8 tr. pt.	63.4	» + $ZnSO_4.7H_2O$ (Monoclinic
25.....	63.5	»
30.....	65.5	»
35.....	68.0	»
37.9 tr. pt.	69.4	» + $ZnSO_4.7H_2O$ (Rhombic)
40.....	70.5	$ZnSO_4.6H_2O$
45.....	73.0	»
50.....	76.2	»
55.....	80.0	»
60.....	85.2	»

ZINC SULFIDE ZnS.

1000 cc. aq. 2.0 n H_2SO_4, sat. with H_2S at 1 atmosphere pressure, dissolve 0.6172 gm. ZnS ($= 6.34.10^{-3}$ gm. mols. ZnS) at 20°. (Moser and Behr, 1924.)

ZINC Benzene and Naphthalene SULFONATES.

Solubility of Each Separately in Water. (Ephraim and Seger, 1925.)

Results for Zinc Benzene sulfonate.

t°.	Gms. $Zn(C_6H_5SO_3)_2$ per 100 cc. sat. sol.	Solid Phase.
10.0.....	14.769	$Zn(C_6H_5SO_3)_2.6H_2O$
34.0.....	19.107	»
49.5.....	24.705	»
64.5.....	32.018	»
80.5.....	40.085	»
82.0.....	41.014	»

Results for Zinc Naphtalene-2-sulfonate.

t°.	Gms. $Zn(C_{10}H_7SO_3)_2$ per 100 cc. sat. sol.	Solid Phase.
20.....	0.487	$Zn(C_{10}H_7SO_3)_2.6H_2O$
32.....	0.579	»
45.....	0.853	»
54.5.....	1.218	»
65.....	1.690	»
76.5.....	2.512	»
82.....	3.130	»

Solubility of Several Zinc Sulfonates in Water.

Compound.	Formula.	t°.	Gms. anhydrous cmpd. per 100 cc. sat. sol.	
Zinc Anthracene-1-sulfonate...	$Zn(C_{14}H_9SO_3)_2.6H_2O$	20	0.05	(1)
» » -2- » ...	$Zn(C_{14}H_9SO_3)_2.6H_2O$	20	0.00741	(1)
» Naphthalene-1- » ...	$Zn(C_{10}H_7SO_3)_2.6H_2O$	17	0.659	(2)
» » -6- oxy -2- » ...	$Zn(C_{10}H_7SO_3)_2.8H_2O$	20	0.874	(1)
» » -5-chlor-1- » ...	$Zn(C_{10}H_6ClSO_3)_2\ 4H_2O$	20	1.205	(1)
» -2.6.8- { Naphthylamine di-	$ZnC_{10}H_5NH_2(SO_3)_2$	15	34.5 *	(3)
» -2.5.7- { sulfonate..... }		15	39.4 *	(3)

(1) Ephraim and Pfister, 1925 *a*. (2) Ephraim and Seger, 1925. (3) Braunschweig, 1922, 1926.

* These results are in terms of grams per 100 grams of the saturated solution instead of gms. per 100 cc. sat. solution.

ZIRCONIUM Oxy CHLORIDE $ZrOCl_2.8H_2O$.

Solubility of Zirconium Oxychloride in Aqueous Hydrochloric Acid at 20°. (v. Hevesy, 1925.)

Constant agitation for many hours was employed. The zirconium oxychloride contained 0.4 % oxide of hafnium. The solid phase was $ZrOCl_2.8H_2O$ up to concentrations of 10 normal HCl.

Normality of Aq. HCl.	Gms. ZrO_2 per liter sat. sol.	Mols. $ZrOCl_2$ per liter sat. sol.	Normality of Aq. HCl	Gms. ZrO_2 per liter sat. sol.	Mols. $ZrOCl_2$ per liter sat sol.
0.26....	358.1	2.91	6.35....	12.78	0.1037
1.47....	264 5	2.14	8.72....	6.74	0.0547
3.72....	102.2	0.832	10.14....	12.17	0.0988
4.97....	40.5	0.329	10.94....	25.3	0.205
5.81....	19.35	0.157	11.61....	41.1	0.334

ZIRCONIUM Ammonium FLUORIDES $Zr(NH_4)_2F_6$ and $Zn(NH_4)_3F_7$.

Solubility of Each Separately in Water.
(v. Hevesy, 1925; v. Hevesy, Christiansen and Berglund, 1925.)

The solutions were saturated by constant shaking in a thermostat.

Compound.	t°.	*d* of sat. sol.	Mol. per liter sat. sol. Zr.	Mol. per liter sat. sol. NH_3.
Zirconium Ammonium Hexa Fluoride $Zr(NH_4)_2F_6$...	0	–	0.611	1.226
» » » » » ...	20	1.154	1.050	2.115
» » » » » ...	45	–	1.842	3.680
» » » » » ...	90	–	2.96	5.93
» » Hepta » $Zr(NH_4)_3F_7$...	0	–	0.425	1.230
» » » » » ...	20	1.086	0.588	1.756
» » » » » ...	45	–	0.788	2.357

Solubility of Zirconium Ammonium Hepta Fluoride in Aqueous Solutions of Ammonium Fluoride at 20°.
(v. Hevesy, 1925; v. Hevesy, Christiansen and Berglund, 1925.)

The mixtures were constantly agitated in a flask of ebonite.

	Mols. per liter			
d of sat. sol.	NH_4F.	NH_3 (attached to Zr).	Zr.	Solid Phase.
1.086	0.002	1.655	0.551	$Zr(NH_4)_3F_7$
—	0.462	1.125	0.375	»
—	0.966	0.726	0.242	»
—	1.941	0.292	0.0972	»
1.068	4.872	0.0678	0.0226	»
1.105	9.721	0.0515	0.01716	»

Solubility of Zirconium Ammonium Fluoride in Aqueous Solutions of Zirconium Ammonium Hexa Fluoride at 20° and Vice Versa.
(v. Hevesy, 1925; v. Hevesy, Christiansen and Berglund, 1925.)

Mols. per liter (found)		Mols. per liter (calculated)		
Zr.	NH_3.	$Zr(NH_4)_3F_7$.	$Zr(NH_4)_2F_6$.	Solid Phase.
0.551	1.655	0.551	0.0	$Zr(NH_4)_3F_7$
0.733	1.831	0.365	0.368	»
1.109	2.383	0.165	0.944	» $+Zr(NH_4)_2F_6$
1.050	2.115	0.0	1.05	$Zr(NH_4)_2F_6$

ZIRCONIUM Potassium Hexa FLUORIDE ZrK_2F_6.

Solubility of Zirconium Potassium Hexa Fluoride in Aqueous Solutions of Hydrofluoric Acid at 20°.
(v. Hevesy, 1925; v. Hevesy, Christiansen and Berglund, 1925.)

Normality of aq. HF	0.125	5.89
Mols. ZrK_2F_6 per liter	0.0655	0.1298

ZIRCONIUM PHOSPHATE $ZrO(H_2PO_4)_2$.

Solubility of Zirconium Phosphate in Aqueous Hydrochloric Acid at 20°.
(v. Hevesy and Kimura, 1925.)

About 0.1 gm. of the compound was shaken with about 150 cc. of the hydrochloric acid in a thermostat for 3 days. 100 cc. of the sat. solution were evaporated and the residue ignited.

Normality of aq. HCl.	Gms. ignited residue from 100 cc. sat. sol.	Mol. $ZrO(H_2PO_4)_2$ per liter sat. sol.
6.01	0.0033	0.00012
10.00	0.0061	0.00023

ZIRCONIUM Thallium SULFATE.

Solubility of Zirconium Thallium Sulfate in Aqueous 20 per cent Sulfuric Acid. (Fernandez, 1925.)

A solution of zirconium sulfate in aqueous sulfuric acid of about 20 per cent concentration was saturated with thallium sulfate at 100° and this solution cooled to several constant temperatures and the weight of ZrO_2 present at each temperature determined. The following three double salts are described, $Zr(SO_4)_2\,2Tl_2SO_4.4H_2O$; $2\,Zr\,(SO_4)_2.Tl_2\,SO_4.8\,H_2\,O$ and $2\,Zr\,(SO_4)_2.7\,Tl_2\,SO_4$. The particulier one in contact with each saturated solution is not designated.

t°.	Gms. ZrO_2 per 100 cc. H_2O.	t°.	Gms. ZrO_2 per 100 cc. H_2O.	t°.	Gms. ZrO_2 per 100 cc. H_2O.
0	0.62	40	0.85	80	2.45
10	0.62	50	1.15	90	2.88
20	0.65	60	1.57	100	3.20
30	0.72	70	2.02		

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(†) Incomplete.

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